DOCUMENT RESUME

ED 331 701 SE 051 598

AUTHOR Dunlop, David; Zellers, Robert W.
TITLE Basic Science Living Skills for Today's World. Teacher's Guide. Student Workbook. Pre-Test. Post-Test.
INSTITUTION Zellers (Robert W.) Educational Services, Johnstown, PA.
SPONS AGENCY Pennsylvania State Dept. of Education, Harrisburg. Div. of Adult Basic and Literacy Education Programs.
PUB DATE 89
NOTE 174p.; For the 1987 Edition, see ED 289 070.
PUB TYPE Guides - Classroom Use - Teaching Guides (For Teacher) (052) -- Guides - Classroom Use - Instructional Materials (For Learner) (051) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC07 Plus Postage.
DESCRIPTORS Adult Basic Education; Adult Education; Biological Sciences; *General Science; *Learning Activities; Lesson Plans; *Science Activities; Science and Society; Science Curriculum; Science Education; *Science Instruction; Science Tests; Teaching Guides; Teaching Methods

ABSTRACT

The purpose of this set of materials is to provide the adult education teacher with the necessary information to assist their students in acquiring the content necessary for a basic understanding of science. The course consists of 25 lessons on basic biological and physical science concepts. The complete set of materials contains a student workbook, teacher's guide, pre-test, and post-test. The teacher's guide, includes suggestions, objectives, discussion questions, vocabulary lists with definitions, and answers for each of the 25 student exercises. Suggestions for the use of, blank answer sheets for, and an answer key to the pre-test and post-test examinations are also included. The student workbook contains student worksheets designed specifically to accompany the 25 lessons of the curriculum. Included therein are matching, fill-in-the-blank style questions, multiple choice items, and true-false questions divided and labelled to accompany the curriculum materials. The pre-test and post-test each contain 62 test items, designed in the first instance to assess prior knowledge of basic science concepts, and, in the second instance, understanding of basic science concepts following completion of the program. (CW)

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Project Title: Basic Science Instructional Materials

Contract Number: 98-9033 (1988-89)

Organization: ADULT EDUCATION SERVICES
Dr. Robert W. Zellers, President
313 Gardner Street
Johnstown, PA 15905

Project Director: Dr. Robert W. Zellers
Education Division
114 Biddle Hall
University of Pittsburgh at Johnstown
Johnstown, PA 15904

Materials may be borrowed through: AdvancE
The Adult Education Clearinghouse
PDE Resource Center
Pennsylvania Department of Education
333 Market Street
Harrisburg, PA 17127-0333

Basic Science Living Skills For Today's World

Written by:

Dr. David Dunlop
and
Dr. Robert W. Zellers

INTRODUCTION

The purpose of this set of materials is to provide the adult education teacher with the necessary information to assist their students in acquiring the content in the text entitled *Basic Science Living Skills For Today's World*. The complete set of materials consists of the following: student textbook, student workbook, teacher's guide, pre-test and post-test.

In this teacher's guide we have provided the instructor with suggestions, objectives, discussion questions, vocabulary, and answers to the student exercises for each chapter of the materials. Also included in the back of the guide is the answer key for the pre-test and post-test examinations. Additional information is also provided for optional use of the testing materials.

We encourage the teacher to utilize the materials in a manner which suits his/her situation in an educationally meaningful fashion.

We believe the materials represent a thorough and interesting manner by which the adult education student can acquire practical and valuable knowledge in the subject area of science. We wish you well in using the materials with your students.

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Biological Science: Lesson 1

This Makes Sense (Human Senses)

Suggestions:

The purpose of this lesson is for the student to have a general understanding in regard to the 5 major senses. The senses (hearing, taste, smell, and touch) are explained in a manner which will permit the student to actually utilize his senses in order to extend his knowledge. The sense of sight is dealt with in Chapter 2 in order to give it fair and full coverage. Each sense is analyzed and the various physiological parts of the respective senses are amply described.

Objectives

1. This lesson should develop the concept that humans have five major senses.
2. This lesson should emphasize the importance of all five senses.
3. This lesson should explain how each of the different senses functions.
4. This lesson should develop an understanding of the problems associated with the senses.
5. This lesson should develop an awareness of the nature of the senses.

Discussion Questions

1. How would you rank the senses in terms of importance to you?
2. Which one of the senses do you think most people rely upon and why is that the case?

3. Can you describe how each of the senses works?
4. What are some of the problems associated with the various senses?
5. Can you explain the need to utilize each one of the senses?

Vocabulary

Eardrum: A thin membrane that separates the middle ear from the external ear.

Sound Wave: Air molecules traveling through the air which are vibrating.

Vibrate: To set in a back and forth motion.

Fluid: Able to flow, not solid.

Taste Bud: Any of the cells in the tongue that are the sense organs of taste.

Stimulation: To stir up or make active.

Receptors: Nerve endings which receive a sensation.

Answers For Student Exercises

I. Matching

1-C; 2-F; 3-D; 4-A; 5-H; 6-J; 7-B; 8-I; 9-G; 10-E

II. Fill-in-the blank

1. eardrum; 2. sound wave; 3. fluid; 4. taste buds; 5. stimulation; 6. receptors; 7. vibrate

III. Multiple Choice

1-a; 2-d; 3-c; 4-a; 5-d

IV. True and False

1-T; 2-T; 3-F; 4-T; 5-T; 6-T; 7-T; 8-F; 9-T; 10-T; 11-F; 12-T; 13-F

Biological Science: Lesson 2

I See You
(Eye Structure & Function)

Suggestions:

The purpose of this lesson is to have the students gain a knowledge of how the eye functions and at the same time develop an appreciation for its complexity and the priceless value it brings to our lives. Specific parts of the eye will be covered as well as problems that occur in the eye. Prevention and different corrective measures will also be discussed.

Objectives

1. This lesson should develop the concept that the eye is delicate and a complex organ.
2. This lesson should emphasize the need to protect our eyes.
3. This lesson should explain the function of selected parts of the eye and relate them to a camera.
4. This lesson should explain the different problems associated with the eye.
5. This lesson should develop an awareness of why most people rank the sense of sight above all other senses.

Discussion Questions

1. What do you think is at a greater disadvantage, a person who is nearsighted or a person who is farsighted? Would your answer be the same if you were living in

days of cavepeople? Explain.

2. Explain now the eye and a camera are similar.
3. A car is approaching you at night with its high beams on; describe the process that takes place in your eye.
4. Eye examinations are very important to ensure that good health is maintained in the eyes. Name the different parts of the eye the doctor will be looking at as well as some eye problems that are common occurrences in many people.
5. Explain why it is so very important to protect our eyes while doing certain jobs and how we can prevent injury to our eyes while doing common everyday jobs.

Vocabulary

Cornea:	The white portion of the eye that is easily noticeable and which is a protection cover for the inner parts of the eye.
Pupil:	The small dark opening behind the cornea that changes in shape depending on the amount of light present.
Iris:	The colored portion of the eye.
Lens:	Found behind the iris, it changes shape allowing different images to be focused on the retina.
Retina:	Inner layer of the eye.
Rods and Cones:	Special cells found in the eye that are designed to sense light.
Optic Nerve:	Comes from the brain and enters the back of the eye. It is used to transfer messages from the eye to the brain.
Visual Purple:	A chemical found in the eye to help a person see in dim light.
Nearsighted:	Blurred vision because the image focuses in front of the retina.
Farsighted:	Opposite of nearsighted, images fall behind the retina blurring vision.

Astigmatism: Caused by the cornea being irregularly shaped resulting in images being out of focus.

Answers For Student Exercises

I. Matching

1-F; 2-I; 3-B; 4-E; 5-A; 6-J; 7-C; 8-D; 9-G; 10-H

II. Fill-in-the blank

1. retina; 2. pupil; 3. nearsighted; 4. visual purple; 5. cornea; 6. optic nerve; 7. iris; 8. astigmatism; 9. lens; 10. rods and cones; 11. farsighted

III. Multiple Choice

1-d; 2-b; 3-c; 4-a; 5-d

IV. True and False

1-T; 2-F; 3-F; 4-F; 5-F; 6-T; 7-F; 8-T; 9-T; 10-F

Biological Science: Lesson 3

Are You Becoming Old? (Aging, Life Expectancy)

Suggestions:

The purpose of this lesson is to have the students gain knowledge of how some professionals think the aging process works and how the average life expectancy has increased over the years. The life expectancy of humans in different countries will be discussed as well as different living species and their life spans.

Objectives

1. This lesson should develop the concept that aging is a natural process, but one that can be tempered by modern medicine, good nutrition, etc.
2. This lesson should emphasize the continuing increase in life expectancy.
3. This lesson should explain how life expectancy data can be influenced by infant deaths.
4. This lesson should explain that not all living species have the same life span, and some live much longer than the human species.

Discussion Questions

1. Why do you think women tend to live longer than men?
2. Why do you think child labor laws have helped to lengthen the span of a person's life?
3. Why are some countries' life expectancy levels lower than the U.S.? How do

you think we could help raise them?

4. Let us pretend the "Fountain of Youth" has been found. What do you think will happen to different species?
5. Over the years the life expectancy level has been increasing for various reasons. At what age do you think the life expectancy level will level off? Why?

Vocabulary

Aging: The process of getting older.

Life Expectancy: The average age one can expect to live.

Child Labor Laws: Laws that were created to protect children from having to go out of the home to work.

Inherit: In science a term meaning the receiving of certain genes by children from their parents. For example, a mother passes on the genes of blue eyes to her daughter, or the daughter inherits them.

Life Span: The length of a person's life.

Genetic Program: A process of inheriting from our parents.

Answers For Student Exercises

I. Matching

1-F; 2-I; 3-J; 4-A; 5-K; 6-E; 7-G; 8-H; 9-C; 10-B

II. Fill-in-the blank

1. life expectancy; 2. aging; 3. life span; 4. genetic program; 5. child labor laws; 6. inherit

III. Multiple Choice

1-c; 2-b; 3-a; 4-d; 5-c

IV. True and False

1-F; 2-T; 3-T; 4-T; 5-F; 6-F; 7-F; 8-T; 9-T; 10-F; 11-F; 12-T

Biological Science: Lesson 4

Here Come The Germs
(Fever, Infection, Immunity)

Suggestions:

The purpose of this lesson is for the student to have a general understanding in regard to germs and how we contract and fight them. Specific ways germs travel are covered as well as specific illnesses that can be produced from the germs. Ways to avoid and protect ourselves from these illnesses are also discussed.

Objectives

1. This lesson should explain why there are advantages and disadvantages to having a fever.
2. This lesson should convey that germs can be spread in many different ways.
3. This lesson should develop an awareness toward hygiene and how it can be a preventive measure against the invasion of germs.
4. This lesson should explain how our bodies can protect us and fight for us against certain germs.
5. This lesson should develop an understanding of how our bodies can become immune to certain germs.

Discussion Questions

1. Name some different ways we can prevent germs from entering our bodies.
2. Discuss ways our bodies protect us from getting sick.

3. Explain why sometimes a fever is good for us, however, also explain why we usually try to get rid of one.
4. Name some different types of illnesses that are usually only contracted once during a lifetime. Why is this?
5. Give examples of certain things that carry germs or move them from one place to another

Vocabulary

Fever: Higher than normal body temperature.

Germs: Foreign bodies that enter our bodies and cause illness.

Immunity: Protection from your own body against diseases caused by germs.

Vaccination: Injection of a dead or weak form of a specific germ to prevent an illness.

Antibiotics: Medicine made from living organisms to help kill bacteria.

Chemotherapy: A process that uses different chemicals to kill germs.

Antibodies: Made by your body to destroy germs that make you sick.

Serum: A medicine containing antibodies that will help fight germs.

Answers For Student Exercises

I. Matching

1-E; 2-H; 3-I; 4-K; 5-B; 6-J; 7-D; 8-A; 9-G; 10-F

II. Fill-in-the blank

1. vaccination; 2. immunity; 3. serum; 4. germs; 5. fever; 6. antibodies;

7. chemotherapy; 8. antibiotics

III. Multiple Choice

1-a; 2-d; 3-c; 4-d; 5-b

IV. True and False

1-F; 2-T; 3-F; 4-T; 5-T; 6-T; 7-F; 8-T; 9-F; 10-F; 11-F; 12-F; 13-T; 14-T; 15-F; 16-F; 17-T; 18-T

Biological Science: Lesson 5

Thin is In (Calories)

Suggestions:

The purpose of this lesson is to have the student gain a general knowledge of how a person's diet includes many different types of foods containing calories. The concept of a calorie and how it affects weight gain and loss will be discussed as well as the caloric value of many foods. Exercise will also be discussed and its effect on caloric consumption.

Objectives

1. This lesson should develop the concept that weight gain and loss are dependent upon the number of calories consumed, metabolic rate and level of exercise.
2. This lesson should emphasize that many "fad" diets are not healthy.
3. This lesson should explain the relationship between energy and calories.
4. This lesson should develop an understanding toward the proper and healthy way to loose weight, gain weight, or stay at a current weight by the process of counting calories.
5. This lesson should provide a student with the knowledge of healthy foods and exercise for a proper diet, along with the calories of different foods and the burning up of calories by different exercises.

Discussion Questions

1. Would you gain more weight by eating a pound of fatty meat or a pound of lean meat? Remember, in both cases you will eat one pound of the food.
2. Name some different types of fad diets you have heard about or maybe someone in your family has tried. What do you think of these types of diets and are they sensible?
3. Why do you think it is so important for people in our society to be thin, while in some cultures people would rather be heavier?
4. Why do you think it is easier for some people to stay slimmer or take weight off easier than it is for others.
5. Give some examples of things included in a healthy diet plan.

Vocabulary

Overweight: Weighing more than normal. Someone who takes in more calories than he can burn off.

Diet: A plan that someone uses to stay healthy and maintain an ideal weight, or a plan to lose weight by someone who is overweight.

Diet Clinic: A place that specializes in helping people lose weight.

Calories: A unit of heat energy in which food is measured.

Body Fat: Fat that is stored in the body because there has been an excess of calories that the body cannot use.

Exercise: Physical activity that is essential in helping our bodies stay healthy.

Answers For Student Exercises

I. Matching

1-E; 2-H; 3-K; 4-I; 5-G; 6-C; 7-D; 8-F; 9-A; 10-L

II. Fill-in-the blank

1. diet clinic; 2. exercise; 3. overweight; 4. fad diet; 5. body fat; 6. diet; 7. calories

III. Multiple Choice

1-d; 2-b; 3-c; 4-a; 5-c

IV. True and False

1-F; 2-F; 3-T; 4-F; 5-T; 6-T; 7-T; 8-F; 9-F; 10-T

Biological Science: Lesson 6

Elephants & Mice (Cell Growth)

Suggestions:

Cells are the basic building blocks of all living organisms. This lesson identifies several functions of living cells. It also describes cell growth as a process that cannot continue forever and is limited by the relationship between surface area and volume. From this information, several formulas are introduced which demonstrate that as a cell's radius increases its surface area increases slower than its volume.

Objectives

1. This lesson should develop the concept that all body cells are about the same size.
2. This lesson should emphasize that oxygen and other materials must be able to enter and leave a cell or it will die.
3. This lesson should explain how the volume of a cell increases faster than the area of a cell.
4. This lesson should introduce several formulas which show how to calculate surface area and volume of a spherical cell.
5. This lesson should explain that the rate of cell growth depends on the relationship between the surface area and the volume of the cell.

Discussion Questions

1. Why is it impossible for a cell to continue to grow forever?
2. Do you think there is an "optimum" radius that determines the size of most cells? Why or why not?
3. What things can damage or kill a cell?
4. Why do some single cells separate to make two cells when they become too large?

5. When your arm or leg "falls asleep" what happens to those cells?

Vocabulary

Cell: Small spherical structure that makes up all living organisms.

Cell Growth: Characteristic of a cell that is determined by the relationship between surface area and volume of a cell.

Radius: The distance between the center of the spherical cell and its edge.

Cell Waste: Poisons which are produced in the cell and must exit through the edge.

Answers For Student Exercises

I. Matching

1-A; 2-E; 3-F; 4-D; 5-C; 6-B; 7-G

II. Fill-in-the blank

1. surface area; 2. slower; 3. radius; 4. more, equal; 5. oxygen; 6. square, cube; 7. separate; 8. volume

III. Multiple Choice

1-d; 2-d; 3-d; 4-c; 5-d

IV. True and False

1-T; 2-F; 3-F; 4-F; 5-T; 6-T; 7-F; 8-F; 9-F

Biological Science: Lesson 7

Dangerous Characters (Life Cycles, Parasites, Disease)

Suggestions:

The purpose of this lesson is for the student to have the student gain a general knowledge of dangerous living creatures, both plants and animals. This lesson should also cover different ways to destroy these harmful organisms, as well as discuss the terminology associated with them.

Objectives

1. This lesson should develop the concept of life cycles.
2. This lesson should emphasize that an understanding of life cycles is important in helping us to manage dangerous organisms.
3. This lesson should explain how the elimination of a host can break the life cycle.
4. This lesson should give various examples of different types of dangerous living organisms.
5. This lesson should explain that not all dangerous plants and animals are easy to discover.

Discussion Questions

1. If everyone in the country cooperated, would it be possible to eliminate a pest such as a mosquito? Why or why not?

2. Describe the life cycle of the sheep lover fluke, and where in its life cycle could it be stopped from doing any harm.
3. Why is it important to understand about life cycles? Who do you think would benefit most from this knowledge and why?
4. How can people in countries such as China, where some parasites present a threat, protect themselves from danger?
5. Why do you think it is important for biologists to study about these dangerous forms of life?

Vocabulary

Asexual: Reproduction that takes place without eggs and sperm.

Bacteria: A very small organism involved in the production of disease.

Biology: The study of life.

Dormant: In a state of rest or inactivity.

Fungi: Any of a small group of simple plants that have lost their chlorophyll or color. Example - mold.

Host: An organism that is being robbed of nourishment.

Life Cycle: The different growing stages of an organism.

Organism: Any form of animal or plant life.

Parasite: An organism that "steals" its nourishment from another organism.

Sheep Liver Fluke: A flat worm that is a parasite in many animals including humans.

Toxin: A poisonous substance generated by plants or animals and causing various diseases.

Answers For Student Exercises

I. Matching

1-F; 2-I; 3-H; 4-A; 5-C; 6-E; 7-J; 8-K; 9-G; 10-B

II. Fill-in-the blank

1. bacteria; 2. parasite; 3. biology; 4. asexual; 5. sheep liver fluke; 6. host; 7. life cycle; 8. toxin; 9. dormant; 10. fungi; 11. organism

III. Multiple Choice

1-c; 2-b; 3-a; 4-d; 5-b

IV. True and False

1-T; 2-F; 3-F; 4-T; 5-T; 6-F; 7-F; 8-F

Biological Science: Lesson 8

Who Determines Sex? (Chromosomes, Sex Determination)

Suggestions:

The purpose of this lesson is to have the student gain a general knowledge of who determines the sex of a baby and how this is done. Specific terms will be covered concerning individualism and how people receive certain characteristics from their parents.

Objectives

1. This lesson should develop the concept that each offspring is the result of a combination of an equal number of genes from each parent.
2. This lesson should emphasize that the sex of a human child is not controlled by the mother.
3. This lesson should explain why females do not become bald as frequently as males.
4. This lesson should explain the differences between sex-linked traits and sex-influenced traits.
5. This lesson should explain that not all species determine the sex of their offspring like humans.

Discussion Questions

1. Do you think that it would be a good idea to develop a way for parents to be able

to select the sex of their child? Why or why not? What do you think would happen?

2. Before we gained the knowledge of who determined the sex of a baby, why do you think women were most likely to be blamed if a child of a certain sex were to be born?
3. Why are half of all babies born female and the other half born male?
4. Eye color is an example of a trait that is determined by both parents. What are some other traits that we receive from our parents?
5. Explain the difference between sex-linked traits and sex-influenced traits.

Vocabulary

Body Cell: Microscopic structures in the body that are essential to life.

Chromosomes: Found in the body cells, they contain the genes that we inherit from our parents.

Gender: The sex of a person (male or female).

Sex Chromosomes: A pair of chromosomes found in the body cells that determine the sex or gender of a child.

Sex Linked: A type of genetic trait that usually occurs more in one sex than the other.

Sex Influenced: A type of trait that occurs in both males and females.

Traits: A quality about a person that is inherited from parents through their genes.

Answers For Student Exercises

I. Matching

1-E; 2-H; 3-G; 4-I; 5-B; 6-C; 7-F; 8-K; 9-D; 10-J

II. Fill-in-the blank

1. gender; 2. traits; 3. sex linked; 4. chromosomes; 5. genes; 6. sex influenced; 7. body cells; 8. sex chromosome

III. Multiple Choice

1-d; 2-c; 3-a; 4-b; 5-b

IV. True and False

1-F; 2-T; 3-T; 4-F; 5-T; 6-F; 7-T; 8-F; 9-T; 10-T

Biological Science: Lesson 9

For the Birds
(Bird Anatomy & Behavior)

Suggestions:

The purpose of this lesson is to have the student gain a general knowledge of birds and their behavior. Many different types of birds will be discussed as well as their anatomy and how it enables them to fly. The discussion of birds ranging in all shapes and sizes should also take place to allow the students to see diversity of this species.

Objectives

1. This lesson should develop the concept that birds, like many animals, have very interesting behaviors and adaptations that allow them to be very efficient in what they do.
2. This lesson should emphasize the ways in which birds are well designed for flight.
3. This lesson should explain how a "magnetic sense" would be used by birds during migration. Also, it explains why the sun and stars by themselves do not provide enough information for migration to be successful.
4. This lesson should develop an understanding that this is a very large species ranging from the very, very small to the huge and powerful.
5. This lesson should explain why a birds eye sight is superior, and how it helps it survive.

Discussion Questions

1. Which birds, if any, do you think should be protected by law? Explain your answer.
2. What types of birds are familiar around this particular area, and when do you usually see them?
3. Why is the life span of most birds short?
4. Why do you think the "typical" bird watcher is male and lives in one of the Rocky Mountain States?
5. If you could be any type of bird which one would it be, and why? Also explain what would occur in a typical day.

Vocabulary

Altitude: The height above sea level or the distance upward.

Anatomy: The structure of an animal or a plant.

Membrane: A flexible layer of animal tissue.

Migrate: Flying long distances to get to another area.

Ovary: A reproductive organ found in females.

Split Eye: A type of eye that allows some birds to look forward and sideways at the same time.

Third Eyelid: The clear protective cover of a bird's eye that helps the bird see when it is flying.

Answers For Student Exercises

I. Matching

1-G; 2-H; 3-B; 4-A; 5-E; 6-F; 7-D; 8-L; 9-I; 10-C

II. Fill-in-the blank

1. anatomy; 2. third eyelid; 3. altitude; 4. ovary; 5. migrate; 6. membrane; 7. split eye; 8. streamlined

III. Multiple Choice

1-c; 2-c; 3-d; 4-a; 5-b

IV. True and False

1-T; 2-F; 3-F; 4-F; 5-T; 6-T; 7-F; 8-T; 9-T; 10-F; 11-T; 12-T

Biological Science: Lesson 10

Amazing Animals (Communication, Animal Behavior)

Suggestions:

People of all ages seem to enjoy learning about animals and their behavior. This lesson selects the sparrow, honeybee, sexton beetle and duck to expand upon some of the behavior of each of these particular species. The four general types of behavior emphasized are: reflexive, instinctive, learned and problem solving. One instinctive behavior discussed extensively is the process of imprinting as it occurs in some animals and possibly in humans.

Objectives

1. This lesson should develop the concept of animal behavior so that your students realize that animal behavior is both interesting and complex.
2. This lesson should emphasize that a better understanding of animals can improve the lives of people.
3. This lesson should explain the four types of behavior that are discussed in the book and discuss the differences between them.
4. This lesson should develop the concept that humans exhibit four types of behavior and show examples of these behaviors.
5. This lesson should explain what is meant by "problem solving" and discuss why it is a higher level of thinking than instinct or learned behavior.
6. This lesson should explain the importance of imprinting in animals and humans and discuss why this process is of value in nature.

Discussion Questions

1. In what ways do you think that the study of animal behavior helps us to understand human behavior?

2. Why are instincts important to animals? In what ways do instincts help an ani mal survive?
3. Why is "problem solving" considered a higher level of behavior. List some examples of problem solving that you have seen or read about in humans or animals.
4. Why is it important that insects such as bees or animals such as beavers have a way to communicate in order to exchange some information from one to another?
5. Why is imprinting important for some animals such as ducks, geese and sheep?

Vocabulary

Reflex: An involuntary action caused by a stimulus to a muscle or gland. Example: hiccup or eye blink when something touches eye.

Learned Behavior: An action that has been acquired by either study or experi ence.

Instinct: Inborn or natural tendency to behave in a certain way char acteristic of the species.

Problem Solving: Ability to work out a solution to a difficult matter.

Scavengers: An animal that eats other dead animals or decaying matter.

Imprinting: An early experience in life that determines social behavior later in life.

Answers For Student Exercises

I. Matching

1-B; 2-H; 3-G; 4-I; 5-F; 6-C; 7-A; 8-J; 9-D; 10-E

II. Fill-in-the blank

1. reflex, learned, instinct; 2. learned; 3. instinctive; 4. humans;

5. honey bee; 6. dance; 7. baby beetles; 8. burying beetle; 9. imprinted.

III. Multiple Choice

1-c; 2-d; 3-b; 4-c; 5-a

Biological Science: Lesson 11

How Distant is the Storm? (Speed of Sound & Light)

Suggestions:

Electrical storms can be dangerous if precautions are not taken. This lesson provides some ways to estimate the proximity of the storm and to determine if the storm is moving closer or further away. The distance from a storm is important for the observer, since decisions can be made about safety. Important science concepts such as the speed of light and sound are discussed to explain these everyday occurrences of lightning and thunder.

Objectives

1. This lesson should develop the concept that light and sound travel at different speeds.
2. This lesson should emphasize how fast light travels through air.
3. This lesson should explain why temperature changes the speed at which sound travels.
4. This lesson should develop an awareness of a storm's proximity by observing the time lag between lightning and thunder.
5. This lesson should develop an appreciation for estimates in determining the distance from a storm and how it could be a valuable source of information during a lifetime.

Discussion Questions

1. When an electrical storm is directly overhead, why do the thunder and lightning appear to occur at the same time even though we know that the speed of light and sound are very different?
2. You have probably heard the phrase, "lightning never strikes in the same place twice." However, in one 24 minute period the Empire State Building in New

York City was struck by lightning 8 times. Why did this happen?

3. How do lightning rods protect a building?
4. Why is a golfer in danger on a golf course during an electrical storm? Where should he seek safety?
5. Describe how you would determine your safety when you notice an electrical storm approaching.
6. Would sound travel faster in air or water? Why?

Vocabulary

Lightning: Large electrical spark occurring during a thunderstorm.

Thunder: Sound produced by rapid heating and expansion of the air when the lightning passes through.

Electrical Storm: Storms in which thunder and lightning occur.

Grounded: Metal structure or lightning rod connected to the earth by a wire.

Answers For Student Exercises

I. Matching

1-C; 2-E; 3-A; 4-F; 5-D; 6-B

II. Fill-in-the blank

1. lightning; 2. lightning, thunder; 3. two; 4. four; 5. light; 6. away; 7. toward; 8. temperature; 9. estimate; 10. faster

III. Multiple Choice

1-d; 2-d; 3-b; 4-c; 5-a

IV. True and False

1-F; 2-F; 3-T; 4-T; 5-F; 6-F; 7-F; 8-T; 9-T; 10-F

Biological Science: Lesson 12

Is It Frozen? (Characteristics of Ice & Lowering the Freezing Point of Water)

Suggestions:

Problems with ice can be very frustrating to people; however, understanding the process of freezing water may help prevent some disasters. This chapter discusses the differences that exist in the solid form of water (ice) from other solid materials. Ice is less dense than water, and will float on top of water. Water also expands as it freezes. These facts have major impact on the fish in our lakes as well as water pipes in our homes. Also discussed is the situation of ice on the highways and sidewalks and the use of salt and other anti-skid materials on these slippery surfaces.

Objectives

1. This lesson should develop the concept of freezing points.
2. This lesson should emphasize that water is one of the few liquids that is more dense in its liquid form than in its solid form.
3. This lesson should explain density in terms of volume and mass.
4. This lesson should give some practical uses for the concept that water does ex pand when it freezes.
5. This lesson should discuss the reason why salt is put on icy roads.

Discussion Questions

1. Why is it so important to the people and animals that live on Earth that ice floats on water?
2. Why must antifreeze be added to a car's radiator in the winter? How do you know when you have added enough anifreeze?
3. Why is it a good idea to carry along anti-skid materials in your car in the winter?

4. Why is running water less likely to freeze?
5. Why do we put ice packs on a sprained ankle? How does it help the injury?

Vocabulary

Density: Ratio of an object's mass to its volume.

Hydrometer: An instrument that measures the specific gravity of a liquid.

Fahrenheit: Temperature scale where the scale indicates the freezing point of water at 32 degrees.

Celsius: Temperature scale where the scale indicates the freezing point of water at zero degrees.

Answers For Student Exercises

I. Matching

1-G; 2-C; 3-E; 4-B; 5-A; 6-F; 7-I; 8-D; 9-J; 10-H

II. Fill-in-the blank

1. solid, liquid, gas; 2. density; 3. expands; 4. friction; 5. floats; 6. increases; 7. antifreeze; 8. hydrometer; 9. heat

III. Multiple Choice

1-c; 2-d; 3-a; 4-d; 5-a

IV. True and False

1-F; 2-T; 3-T; 4-F; 5-T; 6-T; 7-F; 8-T

Biological Science: Lesson 13

Are You Wet? (Water Facts and Water Cycle)

Suggestions:

The purpose of this lesson is for the student to have the student gain a general knowledge about water and its great importance to all living things. Different ways that water is used to aid us in various tasks will be discussed as well as the terminology involved in these operations. The students should also gain some insight on how the water cycle works and the different stages it goes through.

Objectives

1. This lesson should develop the concept of a cycle in nature.
2. This lesson should emphasize the importance of good water management.
3. This lesson should explain the wide variety of uses for clean water.
4. This lesson should develop an understanding of how very important water is to sustain life.
5. This lesson should explain that we use water in many ways and can enjoy it; however, water can be dangerous at times and cannot be taken for granted.

Discussion Questions

1. Where do towns and cities generally discard their sewage? Where do towns and cities generally get their drinking water?
2. Why do you think we use water as a source of power?

3. Why can't we use ocean water for most of our everyday chores? Why can't we consume it?
4. Explain the water cycle. Where does it start, what stages does it go through, and where does it end?
5. How long do you think a person could survive without water? Can you remember a time that you went without water for a long time?

Vocabulary

Circulates: Moving around, going from one place to another.

Evaporates: The process where water as a liquid is turned into a gas that is stored in the air.

Ground Water: Water that is stored in the ground and then it travels to the oceans.

Heat Energy: Energy that we get from the sun used in evaporating water.

Hydraulic Cycle: Another name for the water cycle.

Liquid: A form of matter that can only take the shape of the container it is in.

Pollution: Substances that cause our oceans and air to become dirty and harmful to various forms of life.

Water: A very important liquid that is essential for life.

Water Cycle: The different stages water goes through. Evaporation - Formation of clouds - Rain.

Waterwheel: Used to create energy for factories a long time ago. The force of water would cause the wheel to turn creating energy.

Answers For Student Exercises

I. Matching

1-H; 2-I; 3-K; 4-A; 5-C; 6-B; 7-E; 8-G; 9-J; 10-F

II. Fill-in-the blank

1. pollution; 2. water; 3. water cycle; 4. liquid; 5. waterwheel; 6. heat energy; 7. ground water; 8. circulates; 9. hydraulic cycle; 10. evaporation

III. Multiple Choice

1-b; 2-c; 3-d; 4-c; 5-d

IV. True and False

1-F; 2-F; 3-T; 4-F; 5-T; 6-T; 7-F; 8-F; 9-T; 10-T

Biological Science: Lesson 14

Moving On Up
(Friction, Inclined Plane)

Suggestions:

Inclined planes can be use to accomplish useful work. This lesson describes the basic scientific concepts of work, friction, and mechanical advantage as they apply to inclined planes. Two types of inclined planes, the screw and wedge, are explained and several examples are presented. It should be noted that the mathematical example associated with Figure 14.1 applies in the limited case when the inclined plane is at an angle of sixty degrees. The main point presented in the example is that the inclined plane always requires less instantaneous effort then vertical lifting.

Objectives

1. This lesson should develop the concept of an inclined plane as one of the simple machines.
2. This lesson should emphasize the difference between effort and work.
3. This lesson should explain the relationship between a screw and an inclined plane.
4. This lesson should explain the basic concept of friction.
5. This lesson should develop a clear distinction between a wedge and screw type of inclined plane

Discussion Questions

1. What is the difference between effort and work?
2. How can you assemble a simple screw inclined plane? How can you change its pitch?
3. Why does friction make the overall effort used to move an object up an inclined plane more then the overall effort of just vertically lifting that object?
4. Why can a person push a much larger amount of weight up an inclined plane

if he/she lifted the weight vertically without an inclined plane?

5. Can you make an inclined plane more efficient? How?

Vocabulary

Work: Movement of an object through some distance.

Effort: "Easiness" of a task, either overall or instantaneous.

Inclined Plane: Wedge-like machine that increases mechanical advantage.

Wedge: Type of inclined plane that is similar to placing two regular inclined planes back to back.

Screw: Type of inclined plane that is like wrapping a regular in clined plane around a nail.

Friction: Resistance caused by two surfaces being rubbed together.

Answers For Student Exercises

I. Matching

1-B; 2-H; 3-G or C; 4-A; 5-E; 6-F; 7-C or G; 8-D

II. Fill-in-the blank

1. work; 2. wrapped; 3. inclined plane; 4. arrow or axe; 5. smooth, rough; 6. propeller; 7. axe or arrow; 8. friction; 9. steeply, gradually; 10. pitch

III. Multiple Choice

1-d; 2-b; 3-a; 4-c; 5-b

IV. True and False

1-F; 2-T; 3-T; 4-F; 5-F; 6-T; 7-T; 8-T; 9-F; 10-F

Biological Science: Lesson 15

Can You Lift It? (Pulleys, Mechanical Advantage)

Suggestions:

Pulleys are simple machines that allow large amounts of weight to be lifted conveniently and efficiently. This lesson describes the two uses of pulleys as changing direction of force, and reducing instantaneous effort. These concepts are applied to fixed and movable pulleys. In the process, the scientific concept of mechanical advantage is presented.

Objectives

1. This lesson should develop the concept of mechanical advantage.
2. This lesson should emphasize the difference between fixed and movable pulleys.
3. This lesson should explain why changing the direction of a force can sometimes be useful.
4. This lesson should explain the difference between theoretical and actual mechani cal advantage in pulley systems.
5. This lesson should emphasize the concept that by reducing the instantaneous force needed on any system, you also increase the length of rope pulled.

Discussion Questions

1. If you keep adding pulleys to a block and tackle, would the mechanical advantage continue to get better? Explain your answer.
2. Why does a fixed pulley not gain mechanical advantage?
3. How many pulleys are needed to change the direction of force?
4. Why is there a difference between theoretical and actual mechanical advantage?
5. Why do pulleys always increase the amount of overall effort needed to

Vocabulary

Pulley:	A grooved wheel supported in a frame.
Block:	One or more pulleys in same frame.
Block and Tackle:	Two or more blocks connected by rope or chain.
Mechanical: Advantage	Reduction in effort needed at any one time.
Fixed Pulley:	A pulley that changes the direction of force but not the amount of force.
Movable Pulley:	A pulley that gains mechanical advantage.

Answers For Student Exercises

I. Matching

1-G; 2-E; 3-C; 4-A; 5-F; 6-B; 7-D

II. Fill-in-the blank

1. direct, mechanical advantage; 2. movable; 3. fixed; 4. forty; 5. ten; 6. block and tackle; 7. one thousand; 8. more; 9. less

III. Multiple Choice

1-a; 2-a; 3-c; 4-c; 5-c

IV. True and False

1-T; 2-F; 3-T; 4-F; 5-F; 6-F

Biological Science: Lesson 16

Three of a Kind (Levers)

Suggestions:

Levers are simple machines that can be used to gain mechanical advantage and lengthen moving distances. This lesson introduces the two main parts of levers, the fulcrum and arm. These parts are explained in relation to class I, class II, and class III levers. The discussion presents the various advantages and disadvantages of each of the three classes of levers through clear illustrations.

Objectives

1. This lesson should develop the concept of a lever.
2. This lesson should emphasize the usefulness of levers in our everyday world.
3. This lesson should explain the differences between the three classes of levers.
4. This lesson should introduce and label the basic parts of levers.
5. This lesson should present an equation that can be used to determine the amount of effort needed to use a lever.

Discussion Questions

1. What type of lever is made if the resistance of a class I lever is moved to the same side of the fulcrum as the effort?
2. Why does a class III lever never give a mechanical advantage?
3. If you are trying to use a class I lever to move a heavy object, how can you make your job easier?
4. How could you change the position of resistance on a class III lever to reduce the effort needed to move the resistance?
5. If you were to build a tall building, could you do it without any form of lever? Discuss your answer with others in your class.

Vocabulary

Lever:	Machine used to change mechanical advantage and lengthen lifting distance
Arm:	The long stick-like part of a lever.
Fulcrum:	Anything that can be used as a pivot point.
Resistance:	Object to be moved.
Effort:	Energy used to move the lever.
Resistance Arm:	distance from resistance to the fulcrum.
Effort Arm:	distance from e fort to the fulcrum.

Answers For Student Exercises

I. Matching
1-H; 2-J; 3-E; 4-F; 5-B; 6-C; 7-I; 8-G; 9-D; 10-A

II. Fill-in-the blank
1. arm, fulcrum; 2. second; 3. one; 4.more; 5. effort, resistance;
6. always; 7. distance; 8. longer; 9. never

III. Multiple Choice
1-c; 2-a; 3-a; 4-b; 5-d

V. True and False
-F; 2-T; 3-T; 4-F; 5-T; 6-F; 7-F; 8-T

Biological Science: Lesson 17

Where is the Big Wheel? (Wheel and Axle)

Suggestions:

The windlass, a system containing a wheel and axle, is a simple machine that can either gain mechanical advantage or speed (distance) when an effort is applied to it. Through examples, this lesson develops the concept of a windlass and explains the relationship between force and speed (distance). It also discusses the relationship between first class levers and the wheel and axle. Finally, the lesson considers the limiting case when the mechanical advantage of a system is equal to one.

Objectives

1. This lesson should develop the concept of the wheel and axle as one of the six simple machines.
2. This lesson should emphasize the option of decreasing force or increasing speed.
3. This lesson should explain the relationship between a first-class lever and the wheel and axle.
4. This lesson should introduce a formula to calculate mechanical advantage for simple systems.
5. This lesson should discuss the meaning of a mechanical advantage that is larger than, smaller than, and equal to unity.

Discussion Questions

1. List five windlasses that you use in your everyday life? Which ones gain mechanical advantage and which ones gain speed or distance?
2. Can you construct a windlass that when effort is applied to the axle, the large wheel spins infinitely fast? What limits the speed?
3. Describe a windlass system that has a mechanical advantage equal to one. What are the wheel and axle radii?

4. Why can a wheel and axle system act as a first-class lever?
5. If you had a screwdriver with a huge handle, would this be useful in turning down screws that a regular screwdriver could not get? Think about a possible problem with such a powerful screwdriver.

Vocabulary

Windlass: A simple machine where an axle is firmly attached to wheel.

Large Wheel: The part of a windlass where applied effort will produce a gain in mechanical advantage.

Axle: The part of a windlass where applied effort will produce a gain in speed or distance.

Compound Machine: A machine with two or more simple machines combined.

Answers For Student Exercises

I. Matching

1-F; 2-D; 3-C; 4-A; 5-E; 6-B

II. Fill-in-the blank

1. axle, wheel; 2. speed, mechanical advantage; 3. larger; 4. smaller; 5. size; 6. knob; 7. spinning top; 8. decrease, increase

III. Multiple Choice

1-b; 2-d; 3-a; 4-a; 5-d

V. True and False

1-T; 2-T; 3-F; 4-F; 5-T; 6-T; 7-F

Biological Science: Lesson 18

High or Low? (Siphons, Barometers, Air Pressure)

Suggestions:

The purpose of this lesson is for the student to gain a general knowledge of how air pressure works and the effects it has on certain everyday events in our lives. Different terms will be discussed and determined how they specifically relate to air pressure. Demonstrations of certain things such as the "sucking" of a straw and the siphon should be examined as to better reinforce the concept of air pressure.

Objectives

1. This lesson should develop the concept of air pressure in fluids.
2. This lesson should emphasize the way in which atmospheric pressure operates.
3. This lesson should explain why it is incorrect to say that you suck liquids through a straw.
4. This lesson should explain what happens to the weather when the atmospheric pressure changes.
5. This lesson should develop the concept of a barometer and how it changes due to the changes in the atmospheric pressure.

Discussion Questions

1. Why do large weather balloons get sent aloft without being completely filled with air?

2. Discuss some everyday applications of air pressure.
3. I was listening to the weather report last night and heard the weather man say that heavy thunderstorms can be expected. Explain what is happening in the atmosphere, and how the weather man can determine this.
4. I have a dish full of water, and I am going to place an empty glass into the water with the open end of the glass down. Can you explain what will take place and why?
5. I am going to visit my aunt who lives in Denver, Colorado. Explain some things that I will experience there that are different from here and why.

Vocabulary

Air:	The gaseous substance of the earth that we breath.
Aneroid Barometer:	A type of barometer that does not contain any liquid and is more convenient to handle.
Atmosphere:	The air that surrounds the earth.
Atmospheric Pressure:	The pressure of air that is produced by the upper layers of the atmosphere.
Barometer:	A device used to measure the atmospheric or air pressure.
Dense:	Very thick, being crowded closely together.
Gravity:	The force that attracts objects to the center of the earth.
Molecules:	Very, very small particles that make up a substance such as air.
Siphon:	A tube-like device that is used to get liquid from one container to another container.
Torricelli:	Developed the idea of the atmosphere having different layers. Also invented the barometer.

Answers For Student Exercises

I. Matching

1- F; 2-H; 3-K; 4-A; 5-L; 6-E; 7-J; 8-B; 9-G; 10-I

II. Fill-in-the blank

1. dense; 2. Torrcelli; 3. atmospheric pressure; 4. molecules; 5. gravity; 6. barometer; 7. air; 8. siphon; 9. aneroid barometer; 10. atmosphere

III. Multiple Choice

1-c; 2-b; 3-a; 4-d; 5-d

IV. True and False

1-T; 2-F; 3-F; 4-T; 5-T; 6-T; 7-F; 8-F; 9-T; 10-F

Biological Science: Lesson 19

Don't Blow Your Fuse
(Fuses, Electricity)

Suggestions:

The purpose of this lesson is for the student to gain a general knowledge about electrical circuits and their uses. Safety should be emphasized when discussing anything dealing with electrical currents. Different terms associated with this lesson on electricity will be discussed as well as their uses in our homes.

Objectives

1. This lesson should develop the concept of a safe electrical circuit.
2. This lesson should emphasize the importance of safety while working with or using electricity.
3. This lesson should explain the difference between a fuse and a circuit breaker.
4. This lesson should develop an understanding of how circuits are used in our homes, and the importance behind them.
5. This lesson should develop an appreciation of how dangerous electricity can be.

Discussion Questions

1. It is often said that extension cords can be an electrical hazard. Do you agree? Why or why not?
2. If you found a person who was in electrical shock, what would you do?
3. How do we prevent circuits from overloading? Would you suggest the use of a penny? Why or why not?

4. Using the table given, determine how many amperes are hooked up to a circuit rated at 18 amperes with an 18 ampere fuse if there is a refrigerator, radio, microwave and a 40 watt light bulb on that circuit. Is this safe? Why or why not?
5. If you do not have an electrical map of your home, how can you determine which outlets are on a given circuit?

Vocabulary

Alternating Current: An electric current that changes in direction.

Ampere: A unit of electrical current.

Circuit: The entire course traveled by an electric current.

Circuit Breaker A safety device that uses a magnet to shut off the current if it gets overloaded.

CPR Treatment: Cardio Pulmonary Recesitation - A treatment that gets a person's heart beating again and helps him breath on his own.

Electricity: The flow of electric particles that is used as a source of power or energy.

Electric Shock: A very dangerous and sometimes deadly type of shock of power or energy.

Fuse: An intentional weak link in a circuit that is designed to melt, thus, warning us of a circuit overload.

Short Circuit: A hazard that occurs when the main flow of electricity does not go through the intended location.

Transmission: To send from one place to another.

Answers For Student Exercises

I. Matching

1-J; 2-G; 3-D; 4-H; 5-A; 6-E; 7-B; 8-F; 9-I; 10-C

II. Fill-in-the blank

1. short circuit; 2. fuse; 3. CPR treatment; 4. circuit; 5. amperes; 6. transmission; 7. alternating current; 8. electric shock; 9. electricity; 10. circuit breaker

III. Multiple Choice

1-c; 2-b; 3-a; 4-c; 5-c

IV. True and False

1-F; 2-T; 3-F; 4-T; 5-T; 6-F; 7-F; 8-T

Biological Science: Lesson 20

A Shocking Experience (Wet & Dry Cell, Static Electricity)

Suggestions:

During the last 200 years, the developments in electricity have given society many of the modern conveniences that we now take for granted. This lesson attempts to explain several of the basic concepts of early electricity. More specifically, the concepts of the electrical storage battery are discussed. The lesson also explains the differences between AC, DC, and static electricity by briefly examining three elementary subatomic particles.

Objectives

1. This lesson should develop the concept of a storage cell for electricity.
2. This lesson should emphasize the improvements in batteries over the years.
3. This lesson should explain how static electricity is different from AC or DC electricity.
4. This lesson should examine the basic physical properties of the proton, neutron, and electron.
5. This lesson should provide an understanding for the incredible pace that electrical technology has progressed.

Discussion Questions

1. Do you think that the electrical process in a voltaic cell would ever slow or stop? Why or why not.
2. Why do batteries "go dead?"
3. Could you ever make the electrons flow in the opposite direction in a voltaic cell? How might you make the process reverse?
4. Why do differences in metals and acid strength produce different amounts of current?

5. You may have heard the expression, "lightning never strikes in the same place." Do you agree with that expression? Why or why not?

Vocabulary

AC: Electrical current that changes direction.

Ammeter: Instrument to measure electrical current.

Battery: Two or more cells connected together.

DC: Electrical current with electrons moving in only one direc tion.

Static Electricity: Large amount of charge that accumulates on objects.

Voltaic Cell: A device that makes electricity from chemical energy.

Answers For Student Exercises

I. Matching

1-A; 2-D; 3-C; 4-I; 5-G; 6-H; 7-E; 8-B; 9-F

II. Fill-in-the blank

1. electrons, protons; 2. neutrons; 3. opposite; 4. static electricity; 5. metals, acid; 6. chemical, electrical; 7. wet cell; 8. zinc, copper

III. Multiple Choice

1-c; 2-b; 3-b; 4-a; 5-b;

V. True and False

1-F; 2-T; 3-F; 4-F; 5-T; 6-F; 7-F; 8-T

Biological Science: Lesson 21

Speed It Up
(Speed, Motion, Momentum and Acceleration)

Suggestions:

Our everyday world is filled with different types of motion. This lesson describes the scientific concepts of speed, motion, momentum, velocity, and acceleration. These concepts are used to develop Newton's three laws of motion. The lesson also explains limiting cases of uniform acceleration and conservation of momentum. However, please note that the second paragraph of "Beyond the Basics" contains some potential inaccuracies.

Objectives

1. This lesson should develop the concepts of speed, motion, momentum and accel eration.
2. This lesson should emphasize the three laws of motion and their application to the everyday world.
3. This lesson should explain how speed and velocity are different.
4. This lesson should evaluate the meaning of uniform acceleration and conserva tion of momentum.
5. This lesson should introduce several fundamental formulas for momentum and average speed.

Discussion Questions

1. What is the physical interpretation of negative acceleration? Why is it useful?
2. Sometimes, while driving a car, the accelerator pedal can be depressed while the car does not gain acceleration. What happened to the engine's force?
3. Can you think of several cases where you have applied a force to an object and the object applied an equal and opposite force on you?

Discuss your answers with your classmates.

4. What happens when two moving objects (cars or people, for example) of differ ent sizes run into each other? Discuss your response in terms of momentum.'

Vocabulary

Acceleration:	Gain in speed per unit time.
Inertia:	Tendency of an object to keep its present state of motion.
Momentum:	Object's mass multiplied by its velocity.
Speed:	Rate of motion.
Velocity:	rate of motion that takes into account the direction of motion.

Answers For Student Exercises

I. Matching

1-G; 2-C; 3-D; 4-H; 5-B; 6-A; 7-F; 8-E; 9-I; 10-J

II. Fill-in-the blank

1. force; 2. second law motion; 3. lighter; 4. conserved; 5. equal, opposite; 6. direction; 7. uniform; 8. momentum, greater

III. Multiple Choice

1-d; 2-b; 3-b; 4-d; 5-a

V. True and False

1-F; 2-T; 3-T; 4-F; 5-T; 6-T; 7-T; 8-F; 9-F

Biological Science: Lesson 22

Falling Apples (Motion, Gravity)

Suggestions:

A basic understanding of gravity can be extremely useful in everyday living. This lesson explains the scientific phenomena of gravitation as well as several distinctive forms of motion. The discussions consider relative motion, periodic motion, and motion in curves in an example oriented approach. Through these examples, many common, everyday problems and situations are discussed.

Objectives

1. This lesson should develop the concept of gravity.
2. This lesson should emphasize the role of gravity in our everyday lives.
3. This lesson should explain how a satellite stays in orbit.
4. This lesson should introduce relative motion, periodic motion, and motion in circles.
5. This lesson should demonstrate that centripetal force is an apparent force.

Discussion Questions

1. Why do you think that most man-made satellites are placed in very similar orbits?
2. Do you think that a satellite in orbit can be described as being in constant "free fall?" Why or why not?
3. Can you think of ways that our lives would be different without gravity? Discuss your answers with classmates.
4. Why do you think that Galileo was persecuted in the early 1600's for his discovery of gravity and other scientific observations?
5. What should be different if the mass of the earth were only 10% of its current mass?

Vocabulary

Centripetal force: The apparent force that pulls objects from the center of motion.

Gravity: Force which pulls all objects toward each other.

Period: Time that a pendulum takes to swing back and forth one time.

Relative motion: Different motions are considered separately to find their combined effect.

Tangent: Motion in a straight line to a circle.

Answers For Student Exercises

I. Matching

1-C; 2-F; 3-B; 4-E; 5-D; 6-G; 7-A

II. Fill-in-the blank

1. mass, distance; 2. large, small; 3. far, close; 4. uniform; 5. relative motion; 6. lengthened; 7. periodic motion; 8. centripetal force; 9. tangent

III. Multiple Choice

1-a; 2-c; 3-b; 4-d; 5-d

IV. True and False

1-F; 2-F; 3-T; 4-F; 5-T; 6-F; 7-F; 8-T

Biological Science: Lesson 23

Saving Energy & Money (Energy Conservation)

Suggestions:

The purpose of this lesson is for the student to gain a general knowledge of how saving energy around the home can save a person or family money over a long period of time. Different energy saving tips will be discussed as well as certain terminology relating to each.

Objectives

1. This lesson should develop the concept of energy conservation.
2. This lesson should emphasize conservation measures that can be done around the home.
3. This lesson should explain why fireplaces do not generally add heat to your house.
4. This lesson should explain how different types of insulation will affect energy saving costs around the home.
5. This lesson should explain why alcohol and cigarettes do not cause a body to get warmer.

Discussion Questions

1. What would happen if your house were 100% air tight? Include indoor pollution in your thinking.

2. Before you can start saving money on energy efficiency what must be done? How?
3. Explain what the R-value is and how it affects energy savings.
4. What do you think is the most energy efficient way to heat your home? Why?
5. What is a fairly new method of heating a home that is gained through a natural resource?

Vocabulary

BTU: British Thermal Unit, A way of measuring energy.

Caulking: A substance used to fill a seam making it watertight or air-tight.

Energy Conversation: Saving or using energy wisely.

Furnace: A structure in which heat is generated for heating a house.

Insulate: A substance used to prevent or reduce the loss of heat energy.

Payback Period: The time that it takes to recover the money that you have invested in energy efficiency.

R-Value: A measurement used for determining different types of insulation.

Thermostat: A device that turns a heating or cooling system on and off to maintain a desired temperature automatically.

Weatherstripping: A narrow strip of metal or wood placed between a door or window to keep cold air out.

Answers For Student Exercises

I. Matching

1- I; 2-G; 3-J; 4-A; 5-D; 6-C; 7-B; 8-F; 9-K; 10-E

II. Fill-in-the blank

1. insulate; 2. payback period; 3. thermostat; 4. BTU; 5. caulking; 6. R-value; 7. energy conservation; 8. weatherstripping; 9. furnace

III. Multiple Choice

1-b; 2-c; 3-a; 4-d; 5-c

IV. True and False

1-T; 2-F; 3-T; 4-T; 5-F; 6-F; 7-F; 8-T

Biological Science: Lesson 24

Kitchen Chemistry
(Fire, Bleach, Boiling Point)

Suggestions:

The purpose of this lesson is for the student to gain a general knowledge of different chemicals used around the house. The importance of some of these chemicals to everyday life should be explained, however, it must be emphasized how they can also be dangerous if not used in a safe way. Terminology associated with these chemicals will also be discussed.

Objectives

1. This lesson should develop the concept of chemistry as a common part of our everyday life.
2. This lesson should emphasize how a knowledge of some basic chemistry can be useful around the house.
3. This lesson should explain why water does not always boil at the same temperature.
4. This lesson should explain why water is not good for all types of fire.
5. This lesson should explain how elevation can affect the boiling point of water.

Discussion Questions

1. Why is it very difficult to get wet wood to burn?
2. Why is it harder to get an egg to hardboil at a higher elevation than at sea level?

3. What types of chemicals are handy to have around the kitchen? Why?
4. Why will a flame go out on a candle when a glass is put over the candle?
5. Explain why we must be careful when we mix various types of cleaning materials. What should you do if this happens?

Vocabulary

Bleaching: The process of removing stains and making white clothes whiter.

Boiling: The process when bubbles form from water and rise to the surface and explode.

Boiling Point: The temperature at which boiling occurs.

Celcius: A temperature scale at which O°C represents the freezing point of water and 100°C represents the boiling point.

Chemistry: The science that deals with the composition, properties and transformation of substances.

Evaporation: The changing of a liquid into a gas.

Flint: A very hard rock used to start fires.

Lavoisier: A French scientist who discovered the reaction of combustible material and air.

Oxygen: An odorless, colorless gaseous substance that is a supporter of life and combustion in air.

Phosphorous Sulfide: A material that burns at a very low temperature.

Pressure Cooker: A special pot that creates pressure to allow water to go above 100°C.

Pyrite: A softer rock used to help in creating fires before there were matches.

Combustible: Capable of catching fire and burning.

Answers For Student Exercises

I. Matching

1-F; 2-I; 3-G; 4-B; 5-H; 6-D; 7-A; 8-E; 9-K; 10-C

II. Fill-in-the blank

1. oxygen; 2. phosphorous sulfide; 3. pressure cooker; 4. flint; 5. bleaching; 6. combustible; 7. chemistry; 8. Lavoisier; 9. Celcius; 10. boiling point; 11. evaporation; 12. pyrite; 13. boiling

III. Multiple Choice

1-a; 2-c; 3-d; 4-b; 5-b

IV. True and False

1-F; 2-F; 3-T; 4-F; 5-T; 6-T; 7-T; 8-F

Biological Science: Lesson 25

Are You Cool? (Evaporation)

Suggestions:

Evaporation is a natural process that occurs as a substance changes the phase from liquid to gas. This lesson describes the basic scientific concept of evaporation as a cooling process that is vital to life. Many examples are used to emphasize the importance of evaporation in controlling the temperature of human bodies. This lesson also explains that liquids have unique evaporation rates. This concept is developed by using examples to describe the difference in temperature when alcohol and water evaporate. It is important to realize that although alcohol may evaporate faster per unit time, its overall capacity to cool may be less then other slower evaporating liquids.

Objectives

1. This lesson should develop the concept of evaporation.
2. This lesson should emphasize the importance of evaporation in keeping peoples' temperature from going too high.
3. This lesson should explain why some liquids feel cooler than others when placed on your skin.
4. This lesson should describe a simple experiment that shows different degrees of cooling for two liquids.
5. This lesson should present several practical everyday applications of evaporation.

Discussion Questions

1. What would happen if you did not sweat?
2. Why do some liquids evaporate faster than other different liquids?
3. What are the conditions that you could set up to evaporate water as

quickly as possible?

4. What are some examples of evaporation that occur in your life everyday? Dis cuss your answer with your classmates.
5. Would spraying water on the roof of a trailer help to keep it cool?

Vocabulary

Evaporation: Cooling process that turns a liquid into a gas.

Heat: Form of energy that can cause evaporation.

Sweating: Natural human evaporation process used to cool your body.

Thermometer: Instrument used to measure the absence or presence of "heat."

Answers For Student Exercises

I. Matching

1-A; 2-C; 3-F; 4-D; 5-G; 6-E; 7-B

II. Fill-in-the blank

1. evaporation; 2. liquids; 3. gases; 4. heat or energy; 5. faster; 6. temperature; 7. energy or heat

III. Multiple Choice

1-a; 2-d; 3-b; 4-d

IV. True and False

1-F; 2-F; 3-T; 4-T; 5-F; 6-F; 7-F; 8-T

USE OF THE PRE-TEST AND POST-TEST

Generally a percentage score of 70% or above indicates adequate knowledge of the content. However, we believe the instructor should use their own judgement in this matter.

In order to use the science materials in an individualized and segmented approach we are providing you with match of the test items to the individual chapters. Therefore, the student may be able to omit a chapter or chapters of the textual materials by correctly answering the test questions of the respective chapters.

PRE-TEST: Chapter 1, Question 1,2,3; Chapter 2, Question 4,5; Chapter 3, Question 6,7,8; Chapter 4, Question 9,10; Chapter 5, Question 11,12,13; Chapter 6, Question 14,15; Chapter 7, Question 16,17,18; Chapter 8, Question 19,20; Chapter 9, Question 21,22,23; Chapter 10, Question 24,25; Chapter 11, Question 26,27,28; Chapter 12, Question 29,30; Chapter 13, Question 31,32,33; Chapter 14, Question 34,35; Chapter 15, Question 36,37,38; Chapter 16, Question 39,40; Chapter 17, Question 41,42,43; Chapter 18, Question 44,45; Chapter 19, Question 46,47,48; Chapter 20, Question 49,50; Chapter 21, Question 51,52,53; Chapter 22, Question 54,55; Chapter 23, Question 56,57,58; Chapter 24, Question 59,60; Chapter 25, Question 61,62.

POST-TEST: Chapter 1, Question 1,2; Chapter 2, Question 3,4,5; Chapter 3, Question 6,7; Chapter 4, Question 8,9,10; Chapter 5, Question 11,12; Chapter 6, Question 13,14,15; Chapter 7, Question 16,17; Chapter 8, Question 18,19,20; Chapter 9, Question 21,22. Chapter 10, Question 23,24,25; Chapter 11, Question 26,27; Chapter 12, Question 28,29,30; Chapter 13, Question 31,32; Chapter 14, Question 33,34,35; Chapter 15, Question 36,37; Chapter 16, Question 38,39,40; Chapter 17, Question 41,42; Chapter 18, Question 43,44,45; Chapter 19, Question 46,47; Chapter 20, Question 48,49,50; Chapter 21, Question 51,52; Chapter 22, Question 53,54,55; Chapter 23, Question 56,57; Chapter 24, Question 58,59,60; Chapter 25, Question 61,62.

We encourage you to photocopy additional copies of the blank answer sheets for repeated use of the materials.

PRE-TEST
Answer Key

Basic Science Living Skills For Today's World

1. A	21. C	41. B	61. A
2. C	22. D	42. A	62. B
3. D	23. B	43. D	
4. B	24. D	44. B	
5. A	25. C	45. D	
6. C	26. D	46. C	
7. A	27. B	47. A	
8. C	28. A	48. C	
9. D	29. D	49. B	
10. D	30. D	50. A	
11. D	31. B	51. D	
12. C	32. D	52. B	
13. C	33. D	53. A	
14. D	34. B	54. C	
15. C	35. C	55. D	
16. C	36. A	56. B	
17. A	37. C	57. A	
18. B	38. C	58. C	
19. C	38. A	59. C	
20. B	40. B	60. B	

PRE-TEST
Answer Sheet

Basic Science Living Skills
For Today's World

1. _____
2. _____
3. _____
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58. _____
59. _____
60. _____
61. _____
62. _____

POST-TEST
Answer Key

Basic Science Living Skills For Today's World

1. D	21. C	41. D	61. D
2. A	22. A	42. A	62. D
3. D	23. C	43. C	
4. C	24. B	44. A	
5. D	25. A	45. D	
6. B	26. D	46. B	
7. D	27. C	47. C	
8. A	28. C	48. C	
9. C	29. A	49. B	
10. B	30. A	50. B	
11. B	31. C	51. B	
12. A	32. C	52. D	
13. D	33. D	53. A	
14. D	34. A	54. B	
15. D	35. B	55. D	
16. B	36. A	56. C	
17. D	37. C	57. D	
18. D	38. C	58. A	
19. A	38. A	59. D	
20. B	40. D	60. B	

POST-TEST
Answer Sheet

Basic Science Living Skills
For Today's World

1. _____
2. _____
3. _____
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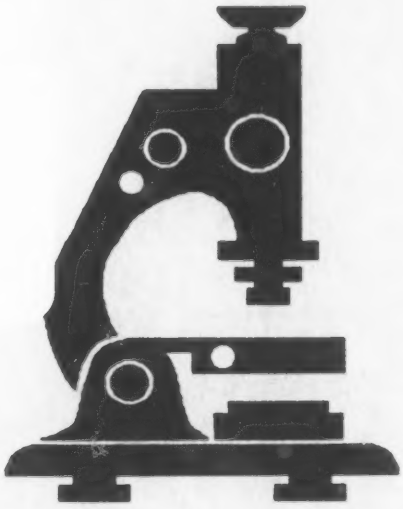
62. _____

Basic Science Living Skills For Today's World



STUDENT WORKBOOK

BEST COPY AVAILABLE

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Project Title:	Basic Science Instructional Materials
Contract Number:	98-9033 (1988-89)
Organization:	ADULT EDUCATION SERVICES Dr. Robert W. Zellers, President 313 Gardner Street Johnstown, PA 15905
Project Director:	Dr. Robert W. Zellers Education Division 114 Biddle Hall University of Pittsburgh at Johnstown Johnstown, PA 15904
Materials may be borrowed through:	AdvancE The Adult Education Clearinghouse PDE Resource Center Pennsylvania Department of Education 333 Market Street Harrisburg, PA 17127-0333

Basic Science Living Skills For Today's World

Written by:

Dr. David Dunlop
and
Dr. Robert W. Zellers

INTRODUCTION

The purpose of this set of materials is to help you accomplish satisfactory understanding of the textual material entitled *Basic Science Living Skills For Today's World.*

We have provided you with various evaluative exercises in order to assess and reinforce the science concepts and knowledge. These consist of exercises such as matching, fill in the blank, multiple choice and true-false.

We believe the materials represent a thorough and interesting manner in which you will acquire valuable knowledge in the subject area of science. Furthermore, we believe that much of the information which you will learn will help you in your daily life.

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Biological Science: Lesson 1

This Makes Sense (Human Senses)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___ 1. helps you to balance your body	A. nose
___ 2. used to see	B. dizziness
___ 3. used to determine sense of touch	C. ear
___ 4. helps determine odors	D. skin
___ 5. the nasal passage contains tiny branches of a special . . .	E. throat
___ 6. salty flavors are detected at . . . of tongue	F. throat
___ 7. diseases that attack the semicircular canal can result in . . .	G. waves
	H. nerve
___ 8. builds up in your ear when you get a cold	I. fluid
___ 9. the purpose of the outer ear is to collect sound . . .	J. tip
___ 10. the inside ear leads to the . . .	

II. ***Fill in the blank*** with the word from the following list.

vibrate	eardrum	taste buds	receptors
sound wave	fluid	stimulation	

1. A thin membrane that separates the middle ear from the external ear is the _____.
2. A _____ is air molecules travelling in the air and vibrating.
3. A _____ flows and is not solid.
4. Your _____ are located on your tongue.
5. Active molecules are the result of _____.

6. _____ are nerve endings which receive a sensation.
7. Sound waves often _____ back and forth.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. The purpose of the outside part of the ear is to collect?
   a) fluid b) water c) sound waves d) energy
2. If you spin around rapidly, all of the fluid in the semicircular canals rushes to one part of the?
   a) eye b) nerve c) heart d) canal
3. The vibration of the eardrum causes some very small bones in the middle part of the ear to?
   a) break b) wither c) vibrate d) collapse
4. With the help of our eyes and other senses, we know the position of our?
   a) body b) nerves c) bones d) pulse
5. Impulses travel from the nerve to the?
   a) ear b) eye c) nose d) brain

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. The ear is a very complex organ and it has four major areas.
___ 2. Sometimes the pressure from the fluids in the ear can actually break the eardrum.
___ 3. When you go up or down a tall hill or mountain the outside air pressure does not change.
___ 4. When you hit a glass with a fork, you cause the glass and fork molecules to vibrate.
___ 5. Chewing gum, swallowing, or yawning are ways to help your ears to "pop."
___ 6. Taste buds contain nerve endings that can tell one type of molecule from another.
___ 7. The nasal passages contain tiny branches of a special nerve called the olfactory nerve.
___ 8. Pain receptors cannot respond to a variety of stimuli.
___ 9. People who have nerve damage and cannot feel pain must be especially careful not to injure themselves.
___ 10. We can recognize the flavors of sour, sweet, salty and bitter.

___ 11. You taste sour flavors from the taste buds at the tip of the tongue.
___ 12. When you smell something, you are actually breathing molecules that are given off by the substance.
___ 13. When you get a cold, the fluids which build up in your ear can actually temporarily improve your hearing.

Biological Science: Lesson 2

I See You
(Eye Structure and Function)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___ 1. this part of the eye sometimes gets scratched by dirt	A. eyelids
___ 2. a flexible part of the eye that sometimes can be irregularly shaped	B. blind spot
___ 3. small place on the retina that cannot sense light	C. constricted
___ 4. when visual purple temporarily stops working of bright lights	D. nearsighted
___ 5. like a camera's shutter our . . . works in the same way	E. night because
___ 6. because an owl lacks cone cells it is considered . . .	F. cornea
___ 7. when you are in a bright room your pupil is . . .	G. astigmatism
___ 8. a person with an eyeball that is too long is	H. dilated
___ 9. When a person's cornea or lens is shaped wrong they have	I. lens
___ 10. a pupil that is very wide because of darkness is	J. day blind

II. ***Fill in the blank*** with the word from the following list.

pupil	cornea	optic nerve	rods and cones
iris	retina	visual purple	farsighted
lens	nearsighted	astigmatism	

1. _____ is the complicated inner portion of the eye.
2. When it becomes bright outside the _____ becomes small to shade the eye from light.
3. A _____ person has trouble seeing things far away.

4. This chemical found in the eye helps people see at night; it is called _____.
5. The _____ is the white portion of the eye that is easily noticeable.
6. Messages that are sent from the eye to the brain travel through the _____.
7. When we notice some blue eyes we are looking at their _____.
8. The condition when images are out of focus because of an irregularly shaped cornea is known as _____.
9. The _____ changes shape to allow different images to detect light.
10. _____ are special cells in the eye that help detect light.
11. Images that fall behind the retina causing someone to have trouble seeing things close at hand is called _____.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. The camera and eye are very similar and have certain parts that work in the same way. Of the following which do the camera and the lens both have?
   a) shutter b) retina c) pupil d) lens
2. What vitamin is essential to having good night vision?
   a) B b) A c) D d) C
3. When your eye is exposed to bright lights your pupil will?
   a) get big b) turn blue c) constrict d) dilate
4. The white portion of your eye that protects the inner parts of the eye is known as?
   a) cornea b) lens c) retina d) pupil
5. A person who goes to an eye doctor and is told they will need glasses to help correct a lens that is too short has?
   a) nearsightedness b) astigmatism c) visual purple d) farsightedness

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. Most people rank sight above all their other sense.
___ 2. The pupil in our eyes cause some people to have blue eyes and some to have brown.
___ 3. When visual purple is absent from someone's eyes it is said that they have good night vision.

___ 4. There are three components that help to detect light in our eyes; they are rods, cones, and the optic nerve.
___ 5. Astigmatism only occurs in older people.
___ 6. Many of the common problems that people have with their eyes relate to the lens.
___ 7. It is harmful for an eye doctor to flash a bright light in your eye.
___ 8. Tears are healthy for they wash and help to keep our eyes clean.
___ 9. Your eyelids close automatically when something comes toward your eyes.
___ 10. A concaved lens is used in the correction of nearsightedness.

Biological Science: Lesson 3

Are You Becoming Old? (Aging, Life Expectancy)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___	1. the dream of being young forever	A. life expectancy
___	2. biblical figure who lived to be 969 years old	B. genetic program
___	3. created to protect children from working at a young age	C. aging
___	4. the average age a person can expect to live	D. United States
___	5. country with the highest male life expectancy in 1980	E. inherit
___	6. the receiving of genes from a parent	F. fountain of youth
___	7. the length of a person's life	G. life span
___	8. lives its entire adult life in one day	H. mayfly
___	9. the process of getting old	I. Methuselah
___	10. the result of inheriting from one's parents	J. child labor laws
		L. Rip Van Winkle

II. ***Fill in the blank*** with the word from the following list.

Child Labor Laws		aging inherit
life expectancy	life span	gene
program		

1. Todays _____ in the United States is about 73 years.
2. _____ is the process of getting old.
3. Mr. Jones lived to be 95 years old, his _____ was longer than Mr. Smith's who lived to be 90 years old.
4. John inherited blond hair from his parents through a _____.

5. _____ were created to protect children from having to work at a very young age.
6. Alice has pretty brown eyes and hopes her unborn baby will _____ them.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. What has not caused a large increase in the human species length of life?
   a) better standard of living b) improved diet c) improved human species
   d) child labor laws
2. Which country has a slightly higher male life expectancy than the United States?
   a) India b) Sweden c) Mexico d) U.S. has the highest
3. To approximately what age can we expect to live to today?
   a) 73 b) 50 c) 65 d) 100
4. Which species has a life span of about 5,000 years?
   a) the maple tree b) the spider plant c) the fern d) the bristlecone pine
5. Which species below lives their entire adult life in only one day?
   a) ants b) bees c) mayflies d) blue spruce

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. No one believes that aging is a result of a "genetic program."
___ 2. Most of the increase in length of life is due to a better standard of living.
___ 3. All plants have a life span.
___ 4. There is no such thing as the Fountain of Youth.
___ 5. The average American life expectancy has gone down since the 1800's.
___ 6. In ancient Rome the average age of death was about 13.
___ 7. The dream of being young forever is no longer just a dream.
___ 8. India had the lowest male life expectancy in 1980.
___ 9. Some believe that aging is the breakdown of our immune system.
___ 10. All living things do not have to get old, for example, the White Pine.
___ 11. The mayfly lives about 25 years, one of the longest living insects.
___ 12. Child labor laws have helped increase the average length of our lives.

Biological Science: Lesson 4

Here Come the Germs (Fever, Infection, Immunity)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___	1.	example of an antibiotic	A. bacteria
___	2.	average body temperature	B. common cold
___	3.	type of social disease	C. 94.2
___	4.	high body temperature	D. mumps
___	5.	illness caught through the air	E. penicillin
___	6.	long term protection against germs	F. malaria
___	7.	usually only a one time illness	G. chemotherapy
___	8.	type of germ	H. 98.6
___	9.	the use of chemicals used to kill germs	I. syphilis
___	10.	illness passed on by a mosquito	J. vaccination
			K. fever

II. ***Fill in the blank*** with the word from the following list.

fever	vaccination	antibiotics	serum
germs	immunity	chemotherapy	antibodies

1. A _____ is an injection of dead or weak germs to prevent you from getting sick.
2. Protection from your body to fight diseases caused by germs is called _____.
3. A _____ contains antibodies that help fight against germs.
4. _____ enter our bodies and cause us to get sick.
5. A high body temperature is known as a _____.
6. _____ are made in your body to destroy germs that cause illness.

7. A process called _____ uses chemicals to kill germs.
8. Medicine made from living organisms to help kill germs is _____.

II. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. A higher than normal body temperature does not usually occur when you are?
   a) sleeping b) fighting germs c) playing in the hot sun d) sick
2. An example of an illness caught by breathing in germs from the air.
   a) sunstroke b) gonorrhea c) polio d) flue
3. What chemical is used to kill germs in the water?
   a) sulfur b) fluoride c) chlorine d) oxygen
4. A medicine containing antibodies that will help fight germs.
   a) chemotherapy b) vaccination c) cough syrup d) serum
5. Germs cannot be spread through . . .
   a) insects b) telephone c) air d) direct contact with people

V. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. Vaccinations are used to cure all diseases.
___ 2. Average body temperature is 98.6
___ 3. Germs can enter our bodies in only one way.
___ 4. We usually get fevers to help fight germs in our bodies.
___ 5. You can stay healthy by keeping insects away from your food.
___ 6. Skin is a protection for us against germs.
___ 7. Penicillin is an example of an antibody.
___ 8. Most vaccinations last for years.
___ 9. Mumps, chicken pox, and the common cold are all examples of once-in-a-lifetime illnesses.
___ 10. Chemotherapy kills all types of germs.
___ 11. All fevers are bad for our bodies.
___ 12. Social diseases are spread through casual contact and can be picked up by simply talking to someone.
___ 13. Even after a germ enters our bodies we have ways to fight it.
___ 14. We have skin on the inside of our bodies.
___ 15. It is abnormal for your body temperature to change slightly throughout the course of the day.
___ 16. Rocky Mountain Spotted Fever comes from the bite of a dog.

___ 17. A virus and bacteria are both types of germs.
___ 18. Very strong acids in the stomach destroy most of the bacteria we eat.

Biological Science: Lesson 5

Thin Is In (Calories)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___	1. food is often measured in . . .	A. exercise
___	2. extra calories in the body	B. 3600
___	3. a place to go to loose weight	C. food calorie
___	4. should be avoided when dieting	D. 7,000
___	5. a type of diet that is not healthy	E. calories
___	6. another name for a "large" calorie	F. 1,200
___	7. to loose two pounds you must eat _____ fewer calories	G. fad diets
		H. body fat
___	8. you should never eat less than how many calories a day?	I. potato chips
		J. 1,600
___	9. a way to reduce calories	K. diet club
___	10. food calories have lots of this	L. energy

II. ***Fill in the blank*** with the word from the following list.

body fat	exercise	overweight	fad diet
diet clinic	calories	diet	

1. John has decided to go to a _____ to help him loose weight.
2. _____ will help you burn off calories when you are trying to loose weight.
3. Ralph is _____ because he takes more calories into his body than he can burn off.
4. Sue decided to try a _____ and got sick because of it.

5. Calories will turn into _____ if they are extra and not burned off.
6. _____ is a plan to keep you healthy or to help you loose weight.
7. The consumption of too many _____ without burning them off will cause someone to gain weight.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. You just ate a piece of pizza with extra cheese which was about 500 calories; of the following exercises which would most likely burn off those calories if done for an hour?
   a) playing the piano b) walking c) ironing d) swimming
2. A woman who weighs 130 pounds and is very active wants to stay at that particular weight. How many calories a day must she consume to maintain her weight?
   a) 1300 b) 2600 c) 1000 d) 5000
3. A healthy diet should always include the following except
   a) low fat milk b) lean meat or fish c) fried foods
   d) fruits and vegetables
4. To loose one pound of weight a person must eat 3,500 fewer calories than the body needs. If a person wants to loose one pound in one week how many calories must he take out of his diet each day?
   a) 500 b) 3000 c) 100 d) 1500
5. Out of the following foods which contains the least amount of calories?
   a) pot roast b) toast c) grape jelly d) ice cream

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. Because fad diets are healthy there are many people trying them.
___ 2. To lose one pound of weight, you must eat 2,500 fewer calories than your body needs.
___ 3. If you eat less than 1,200 calories during a day, it would be difficult to get enough vitamins, protein, and minerals.
___ 4. There is no difference between a small calorie and a large calorie.
___ 5. A diet clinic and a diet camp both strive to accomplish the same thing.
___ 6. Losing weight seems to be the goal for many adults in the United States.
___ 7. The extra calories eaten each day are stored as body fat.

___ 8. Exercise is not all that important in a good diet plan.
___ 9. A person cannot burn off any calories by sitting down to watch TV.
___ 10. A food calorie is a unit of heat energy.

Biological Science: Lesson 6

Elephants and Mice (Cell Growth)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___ 1. small spherical structures that make up living things	A. cell
___ 2. the "wall" around a cell	B. cell growth
___ 3. space "inside" the cell	C. oxygen
___ 4. distance from the center of a cell to the edge	D. radius
___ 5. necessary substance that must enter a cell	E. surface area
___ 6. characteristic that is determined by the relationship between surface area and volume	F. volume
___ 7. substance that is made in cells and must exit through the wall of the cell	G. waste

II. ***Fill in the blank*** with the word from the following list.

cube	equal	more
oxygen	radius	separate
slower	surface area	square
volume		

1. The surrounding "walls" of a cell represents the cell's _____.
2. When a cell grows, its surface area grows _____ than its volume.
3. The distance from the cell's edge to the center of the cell is called the _____.
4. In general, a large person has _____ cells than a small person, but their cells are approximately _____ in size.

5. In order for cells to survive and grow, _____ must be able to get into the cell.

6. When a cell grows, its surface area changes as the _____ of the radius and its volume changes as the _____ of the radius.

7. Single cells cannot continue to grow forever; therefore, at some point the cell must either stop growing or _____ to make two complete cells.

8. All of the material inside of the cell is called the cell's _____.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. Which of the following is NOT an activity that cells must continue to do?
   a) make waste b) remove waste c) get oxygen d) grow
2. Which of the following is NOT needed for growth?
   a) oxygen b) surface area c) time d) excess waste
3. Which of the following is true for the surface area of a round cell?
   a) increases as the cube of radius b) never changes c) changes faster than volume d) changes slower than volume
4. If a cell has an original radius of one unit and later grows to a radius of three units, then which of the following is true?
   a) surface area and volume increase equally b) surface area increases more than volume c) volume increases more than surface area d) volume and surface area do not change
5. If a cell has an original radius is 1 unit and after one day its radius has increased to 5 units, how many times larger is the new volume than the old volume?
   a) same volume b) 5 c) 100 d) 125

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. All living cells make waste, remove waste, and require oxygen.
___ 2. If a cell radius doubles, then its surface area and volume must also exactly double.
___ 3. Surface area increases more quickly than volume, as a cell's radius increases.
___ 4. Cells never poison themselves with waste because they can use most of the waste that they produce.
___ 5. The difference in size between a whale and an ant comes from the number of cells in the animals.

___ 6. The surface area of a cell is the "wall" around the cell.
___ 7. Cell growth does not depend on cell surface area or volume.
___ 8. As the radius of a cell decreases, its volume increases as the cube of the radius.
___ 9. Using special techniques, people have been able to "force" a cell to continue to grow forever.

Biological Science: Lesson 7

Dangerous Characters (Life Cycles, Parasites, Disease)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___ 1. certain kinds are often good examples of very dangerous organisms
___ 2. the study of living organisms
___ 3. some of them have complex life cycles
___ 4. the invention of this had to come before
___ 5. causes illnesses in an organism
___ 6. an example of a plant parasite
___ 7. believed to have died from eating a mushroom
___ 8. is robbed of its body's nourishment
___ 9. produces without an egg or sperm
___ 10. an organism that causes malaria

A. microscope
B. p[illegible]modium
C. p[illegible]asite
D. Christopher Columbus
E. smut
F. bacteria
G. asexual
H. dangerous organisms
I. biology
J. Pope Clement VII
K. host

II. ***Fill in the blank*** with the word from the following list.

bacteria	life cycle	organism	sheep liver fluke
asexual	parasite	biology	toxin
dormant	host	fungi	

1. A very small organism involved in the production of disease is called _____.
2. A _____ is an organism that steals its food from another organism.
3. The study of life is known as _____.

4. Some dangerous organisms reproduce by _____ reproduction.
5. A _____ is a flatworm, that is a parasite in many animals, including humans.
6. A living thing that gets ill because of a dangerous organism stealing its nourishment is called _____.
7. The _____ of different organism grows in different stages.
8. A poisonous substance generated by plants or animals and causing various diseases is known as a _____.
9. A bear that has been asleep all winter has been _____ for months.
10. A group of simple plants that have lost their color is called _____.
11. A _____ is any type of animal or plant life.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. A type of fungi that mid western farmers must be knowledgeable about and most likely dread getting.
   a) mold b) Amanita phalloides c) rust d) Plasmodium
2. People becoming ill from the sheep liver fluke is common in
   a) United States b) Cuba c) Ireland d) Africa
3. How can a farmer eliminate the corn smut?
   a) burn his crop b) eliminate the host c) wash it off
   d) there is no elimination possible
4. A biologist is a scientist who studies the life of many organisms. Of the following, which would he not concern himself with?
   a) humans b) insects c) trees d) rocks
5. The sheep liver fluke goes through many stages of its life cycle. What happens to the larvae of the liver fluke after it leaves a snail?
   a) grows into a large fluke b) it dies if not eaten by a sheep
   c) it turns into a water creature d) it produces more larvae

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. Bacteria were not even known to exist until the mid-1800s.

___ 2. Smuts are an example of an animal parasite.
___ 3. Farmers and gardeners need not concern themselves about the life cycles of certain fungi.
___ 4. One of the most well known rusts is wheat rust.
___ 5. Malaria is caused by a one celled organism named Plasmodium.
___ 6. All types of mushrooms are healthy to eat.
___ 7. Some sources estimate that as many as 100,000 people die each year from snake bites.
___ 8. The invention of the microscope came after the discovery of bacteria.

Biological Science: Lesson 8

Who Determines Sex? (Chromosomes, Sex Determination)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___	1. all of them have a set number of chromosomes	A. XX
___	2. controls the passing of traits from parents to offspring	B. males
___	3. a person's sex is known as . . .	C. sex-linked
___	4. a male has sex chromosomes that look like . . .	D. females
___	5. _____ control the sex of a baby	E. body cells
___	6. a type of trait usually only occurring in one particular sex	F. chromosomes
___	7. _____ are made up of genes	G. gender
___	8. hair color is an example of a . . .	H. genes
___	9. _____ were most likely blamed for the sex of a child in earlier years	I. XY
___	10. a type of trait that occurs in both sexes	J. sex-influenced
		K. trait

II. ***Fill in the blank*** with the word from the following list.

chromosomes	sex-influenced	sex chromosome	gender
traits	genes	sex-linked	body cells

1. Mary had a baby boy, the _____ of her baby is male.
2. _____ are qualities about a person that they inherit from their parents.
3. Color blindness is an example of a _____ trait.
4. _____ are found in the body cells and contain the genes that we inherit from our parents.
5. _____ contain the traits that are passed from parent to offspring.

6. _____ is a type of trait that occurs in both sexes causing different characteristics.
7. Microscopic structures in the body that are essential to life are called _____.
8. _____ will determine if a baby will be male or female.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. All of the following are examples of traits except
   a) eye color b) height c) hair color d) date of birth
2. There are how many pairs of chromosomes in each body cell?
   a) 32 b) 46 c) 23 d) 21
3. Red green color blindness is an example of
   a) sex linked trait b) a careless accident c) sex influenced d) aging
4. About how many males are born compared to females?
   a) 75% b) 50% c) 25% d) 60%
5. What are the odds that a family will have four children all of the same sex?
   a) one in eight b) one in sixteen c) one in two d) one in a thousand

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. The female is the one who determines the sex of a baby.
___ 2. Every normal body cell of a person has 23 pairs of chromosomes.
___ 3. Sex is not determined by chromosomes from both parents.
___ 4. A person's sex is the only trait that is influenced by the sex chromosomes.
___ 5. If a female inherits a pair of "baldness genes," she may not become bald.
___ 6. If a sperm with a "Y" chromosome combines with an egg, the baby will be a girl.
___ 7. Genes control the passing of traits from parents to offspring.
___ 8. About 30% of the babies being born are male and the remaining 70% are females.
___ 9. Prior to the early 1900s nobody knew why some babies were female and other babies male.
___ 10. Sex influenced traits have genes that are the same in each sex, but cause different characteristics.

Biological Science: Lesson 9

For the Birds
(Bird Anatomy and Behavior)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___	1. there are over how many different types of birds?	A. migrate
___	2. the smallest living bird	B. third eyelid
___	3. protects the eye and keeps it clean while a bird flies	C. split eye
___	4. many birds do this every year to get to a warmer climate	D. 107°F-114°F
		E. road runner
___	5. this bird lives near a desert	F. hollow bones
___	6. why is a bird's weight very low?	G. 25,000
___	7. a bird's body temperature usually falls between	H. hummingbird
___	8. the height that a bird flies	I. ovary
___	9. female birds only have one of these making them light in weight	J. 94°F-98°F
		K. 2,500
___	10. helps some birds look forward and sideways at the same time	L. altitude

II. ***Fill in the blank*** with the word from the following list.

streamlined	third eyelid	membrane	altitude
ovary	anatomy	migrate	split eye

1. The _____ of a bird enables them to fly and is different from any other type of animal on earth.
2. The clear protective cover of a bird's eye that helps the bird see when it is flying is known as a _____.
3. Some birds fly at a high _____ above sea level.

4. The _____ is a reproductive organ found in females.
5. Some birds _____ south for the winter months to a warmer climate.
6. A flexible layer of animal tissue is known as a _____.
7. A bird has a _____ if it can look forward and sideways at the same time.
8. _____ is the angular shape of a bird's body that helps it cut through the air.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. Many birds have one eye on each side of its head EXCEPT which one of the following who is a noticeable exception?
   a) robin b) sparrow c) owl d) hawk
2. Birds have the remarkable ability to fly. They can do this because of all of the following except
   a) large heart b) feathers c) sense of direction d) breast muscles
3. Birds have an angular body that helps them cut through the air, this is known as
   a) split b) gliding c) membrane d) streamlined
4. The fastest reliably measured speed of an animal is 106.25 miles per hour. Which of the following set that record?
   a) spine tailed swift b) Antarctic penguin c) cougar d) black panther
5. How can birds fly at speeds of 40-60 miles per hour without losing their vision?
   a) instinctive sense of direction b) third eyelid c) goggles d) split eye

V. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. The eye of a bird is able to change its focus very quickly.
___ 2. Because birds are very common creatures people understand a lot about them.
___ 3. Birds cannot see color.
___ 4. There is only one reason why birds are so light in weight.
___ 5. Birds usually fly at an altitude of less than 1,000 feet.
___ 6. Birds can't look forward very well, except for a noticeable few.
___ 7. Birds can fly only because they are fairly light in weight.
___ 8. Some birds such as the swallow have a special eye called a split eye.
___ 9. The third eyelid of a bird acts kind of like a pair of goggles.
___ 10. The female bird has three ovaries unlike most female reproductive systems.

___ 11. Birds are the fastest animals.
___ 12. The heartbeat of a hummingbird is over 600 beats per minute.

Biological Science: Lesson 10

Amazing Animals (Communication, Animal Behavior)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___ 1. means of passing information from one to another
___ 2. animal's nose pulls back when stung by a bee
___ 3. child crosses new stream without getting shoes wet
___ 4. animal that eats other dead animals
___ 5. dog opens door to food source
___ 6. honeybee's way to show direction to food source
___ 7. the way that an animal acts
___ 8. a colony of bees
___ 9. experiences early in life that determine future social behavior
___10. new born calf drinks milk from mother within minutes of birth

A. behavior
B. communication
C. dance
D. imprinting
E. instinct
F. learned behavior
G. problem solving
H. reflex behavior
I. scavenger
J. swarm

II. ***Fill in the blank*** with the word from the following list.

baby beetles	burying beetle	dance
honeybee	humans	imprinted
instinctive	learned	reflex

1. Animals demonstrate many types of behavior. Three types of behavior are _____, _____ and _____.

2. When you give a command, your pet "shakes hands" with you. This is an example of _____.

3. An example of _____ behavior is when a baby turtle hatches from an egg on shore and begins to crawl to the ocean.

4. Problem solving is mostly thought to occur in _____.

5. The _____ is one insect that can communicate information of a new food source to other members of its colony.

6. When a honeybee finds a new field of flowers, it tells the other bees about this by performing a _____ in the hive.

7. The Sexton Beetle uses small dead animals as a food source for their _____.

8. Another name for the Sexton Beetle is the _____.

9. If a baby quail followed closely behind its mother, we could say that the baby quail has been _____ to the mother quail.

II. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. When squirrels gather nuts to store food for winter, this is an example of what type of behavior?
   a) reflex b) learned c) instinct d) problem solving
2. Mary is a hungry three year old child. She sees candy in a jar on the counter. She can not reach it because she is too short. She is able to reach the candy by pulling a chair over to the counter. She then climbs onto the chair and finally onto the counter top. What type of behavior did the girl show?
   a) reflex b) learned c) instinct d) problem solving
3. What type of behavior do we see when a circus lion jumps through a hoop?
   a) reflex b) learned c) instinct d) problem solving
4. A farmer keeps a duckling away from its mother for the first 16 hours of life. Instead, the duckling is placed with a nest of geese. To who (or what) will the duckling imprint?
   a) father duck b) mother duck c) geese d) farmer
5. The quick movement of a mother deer's tail to tell its baby fawn about nearby danger is an example of what?
   a) communication b) imprinting c) exercise d) discipline

V. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1.Instincts in animals are a learned behavior.
___ 2.The animal with the greatest ability to solve problems is the human.

___ 3. Bees use the sun as a compass to show other hive members the direction to a food source.

___ 4. Honeybees perform their dance outside of the hive so that they can use the sun as a guiding point for other bees.

___ 5. Imprinting is not a very important concept, since animals will always be able to find their mothers anyway.

___ 6. Most people have only a little interest in animals and their behavior.

___ 7. Some people can "read" the dance of a bee.

___ 8. The Sexton Beetle isn't very important in nature, since it is so small.

___ 9. A chicken will never imprint to a non-living object.

___ 10. In order to develop properly, human babies need attention and handling dur ing infancy.

Biological Science: Lesson 11

How Distant is the Storm? (Speed of Sound and Light)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___	1. a big spark or an electrical discharge	A. electrical
___	2. quick increase of air that produces a loud noise	B. grounded
___	3. storm that produces lightning and thunder	C. lightning
___	4. speed of sound at 32 degrees Fahrenheit	D. temperature
___	5. something that changes the speed of sound	E. thunder
___	6.lightning rod connected to earth by wire	F. 1,090 ft./sec.

II. ***Fill in the blank*** with the word from the following list.

away	estimate	faster
four	light	lightning
temperature	thunder	toward
two		

1. During an electrical storm, people standing outside in the storm are in the greatest danger from _____.

2. To be sure if a storm is moving closer or further away, you may count the number of seconds between _____ and _____.

3. If you count 10 seconds between lightning and thunder during an electrical storm, the storm is about _____ miles away.

4. If you count 20 seconds between lightning and thunder during an electrical storm, the storm is about _____ miles away.

5. The speed of _____ is faster than the speed of sound.

6. If you take two readings by counting the time between lightning and thunder and

find that the length of time between the lightning and thunder is getting longer, the storm is moving _____ from you.

7. If you take two readings by counting the time between lightning and thunder and you find that the length of time between the lighting and thunder is getting closer, the storm is moving _____ you.

8. The speed of sound will change as the _____ changes.

9. The system of finding the distance from a storm by measuring the time between when you see the lightning and hear the thunder is an _____.

10. As the temperature goes up, sound travels _____.

II. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. When an electrical storm is moving quickly toward us as we are swimming on a beach, we should do what?
   a) stay in the water b) do not move from the area c) scream and cry d) go to a car or building
2. While playing golf, you see lightning in the distance followed by the sound of thunder 15 seconds later. The storm is about how many miles away?
   a) 1 1/2 b) 2 c) 2 1/2 d) 3
3. How many feet per second does sound travel at 70 F?
   a) 1,090 b) 1,132 c) 1,160 d) 1,120
4. If lightning strikes a person, it may cause what?
   a) only a tingling feeling in the fingers b) the body to light up c) death d) thirst
5. Watching for lightning and listening for the thunder are good ways to do what?
   a) guess the distance of a storm b) make sure your senses are working c) spend a night with the family d) predict tomorrows weather

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. Pain in an arm or leg joint is an accurate way to tell if a storm is coming close to you.

___ 2. Lightning never strikes in the same place more than once.
___ 3.Thunder during a storm will not hurt you, although it may frighten you.
___ 4. Lightning rods should help protect a building against the effects of lightning.
___ 5. Light travels very slowly through the air, and that is why we so seldom see lightning.
___ 6. Thunder is always heard before we see lightning.
___ 7. During a storm, clouds always move in the same direction.
___ 8. If we see lightning and hear a faint rumble 30 seconds later, we probably have plenty of time to prepare for the storm.
___ 9. The speed of sound can change when the temperature changes.
___ 10. Lightning is a form of light and sound.

Biological Science: Lesson 12

Is It Frozen? (Characteristics of Ice and Lowering the Freezing Point of Water)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___	1. solid form of water	A. antifreeze
___	2. solid form of carbon dioxide	B. anti-skid material
___	3. characteristic of freezing water	C. dry ice
___	4. sand on ice	D. electrical wrap
___	5. protection for car radiator	E. expands
___	6. tool used to test freezing point	F. hydrometer
___	7. used to melt snow and ice	G. ice
___	8. adds heat to pipes	H. 0 degrees
___	9. freezing point of water on a Fahrenheit scale	I. salt
___	10. freezing point of water on a Celsius scale	J. 32 degrees

II. ***Fill in the blank*** with the word from the following list.

antifreeze	density	expands
floats	friction	gas
heat	hydrometer	increases
liquid	solid	

1. The three forms that a material can exist in are _____, _____, and _____.

2. The _____ of water is less when it is frozen.

3. Water _____ when it freezes and can create problems in your car radiator in the winter.

4. Because ice is very smooth, you may slip on the ice even if you are wearing boots

because there is not enough _____ between your boots and the ice.

5. Ice is different from most solids because it _____ on water. This keeps the fish alive during the winter.

6. Chains or studs on tires in the winter help keep a car under control on an icy road because it _____ the friction.

7. If you add _____ to your car's radiator, it will help to prevent ice from forming in your radiator.

8. A tool called a _____ will help you decide if you have enough antifreeze in your radiator during very cold weather.

9. When salt is put on ice covered roads or sidewalks, it melts the ice by absorbing _____.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. If an open, frozen, metal container of ice is put in the sun and the heat melts the ice, what will happen to the container?
   a) split open b) side will cave in c) nothing d) side will bulge
2. When you drive down an icy road in the winter, what type of anti-skid material might you find on the road?
   a) salt b) sand c) gravel d) all of the above
3. What happens when you wear boots instead of shoes on an icy sidewalk?
   a) friction is greater b) ice becomes less dense c) ice will change form d) ice will change its temperature
4. The best way to tell if your car's radiator needs more antifreeze is by using which of the following instruments?
   a) thermometer b) thermostat c) barometer d) hydrometer
5. Ice makes drinks colder for which of the following reasons?
   a) removes heat from the drink b) adds energy c) adds coolness to the drink d) makes the drink larger

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1.Because ice floats on top of water, it creates terrible problems for fish during

the winter.

___ 2. Water expands when it freezes.

___ 3. If ice forms in the radiator of your car, it may split apart the metal radiator.

___ 4. Anti-skid materials such as sand on icy roads keep cars from slipping by raising the temperature of the ice.

___ 5. Chains and studs on tires increase the friction on the road surface.

___ 6. Salt can help prevent ice by absorbing heat from the air and cause the ice to melt.

___ 7. If water pipes drip during a very cold night, it will bring into the house ex tremely cold water and allow the water pies to freeze very quickly.

___ 8. Water and ice, even thought they are in different forms, may both be at zero degrees Celsius.

Biological Science: Lesson 13

Are You Wet?
(Water Facts & Water Cycle)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___ 1. what percent of the earth's water is in the oceans?	A. water
___ 2. helps in evaporating water	B. 65%
___ 3. waste that is put into our oceans causing harm to sea life	C. waterwheels
	D. 50%
___ 4. very important for the survival of living things	E. electricity
___ 5. used in creating energy	F. circulation
___ 6. percent of water body weight	G. floods
___ 7. made by a turning generator	H. 97%
___ 8. devastation created by water	I. heat energy
___ 9. part of the water cycle	J. evaporation
___ 10. moving through the water cycle	K. pollution

II. ***Fill in the blank*** with the word from the following list.

hydraulic cycle	evaporates	pollution	water cycle
liquid	water	heat energy	ground water
circulates	waterwheel		

1. Substances that cause our air, land and oceans to become dirty and often very harmful to life is known as _____.
2. _____ is essential for all living things.
3. When water goes through the process of being evaporated, formed into clouds and then turned into rain, it is known as the _____.
4. _____ can only take the shape of its container.

5. A _____ is used to create energy by the force of water.
6. Energy that we get from the sun used in evaporating water is known as _____.
7. _____ is stored in the ground where it travels to the oceans.
8. Water _____ through the water cycle as it moves from one stage to the next.
9. _____ is another name for the water cycle.
10. The process of water being transformed from a liquid into a gas by the sun is known as _____.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. We use water power to make electricity. One way to do this is by using a
   a) river b) dam c) ocean d) water tower
2. There is a lot of water in the world. One estimate says that the Earth has about how much water?
   a) 300 billion cubic miles b) 290 thousand cubic miles
   c) 326 billion cubic miles d) 100 cubic miles
3. About 65% of your body's weight is water. If you weigh 120 pounds, how many of those pounds are water?
   a) 98 b) 33 c) 56 d) 78
4. Evaporation is a very important part of the water cycle. How does evaporation occur?
   a) waterwheel b) rain c) heat energy d) lightning
5. Which of the following can survive without water?
   a) humans b) sunflowers c) camels d) limestone

V. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. There are certain kinds of plants that thrive without water.
___ 2. You can live longer without water than you can live without food.
___ 3. We use water power to make electricity.
___ 4. After evaporation occurs in the water cycle, rain occurs.
___ 5. As early as 100 B.C. people used water to help crush grain.
___ 6. Electricity made by water power costs less than electricity made with oil,

gas, or nuclear power.

___ 7. There is really no value in the natural beauty that water possesses.

___ 8. Water could probably be considered the most important gas on Earth.

___ 9. Most of the water found on Earth is found in the oceans.

___ 10. The hydraulic cycle is another name for the water cycle.

Biological Science: Lesson 14

Moving on Up
(Friction, Inclined Plane)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___	1. a type of machine that looks like a hill	A. friction
___	2. movement of an object along some distance	B. inclined plane
___	3. two inclined planes placed back to back	C. nail
___	4. the resistance caused by two surfaces rubbing together	D. pitch
___	5. a type of inclined plane that is "wrapped"	E. screw
___	6. an example of a screw type of inclined plane	F. spiral staircase
___	7. an example of a wedge type of inclined plane	G. wedge
___	8. gives a screw type inclined plane mechanical advantage	H. work

II. ***Fill in the blank*** with the word from the following list.

arrow	axe	friction
gradually	inclined plane	pitch
propeller	rough	smooth
steeply	work	wrapping

1. When you move a box across a street, you have done _____.
2. A screw type of inclined plane can be made by _____ a regular inclined plane around a pole.
3. To make hard lifting jobs easier, people often use a(n) _____.
4. A(n) _____ shape gives reduced friction because it has a streamlined shape.
5. An incline plane with a(n) _____ _____ surface will be more efficient then an inclined plane with a(n) _____ _____ surface.

6. A(n) _____ is an example of a screw type of inclined plane.

7. A(n) _____ is an example of a wedge type of inclined plane.

8. _____ causes a rough inclined plane to be less efficient than an inclined plane with a smooth surface.

9. To move a box up a(n) _____ sloped inclined plane, more effort is needed at any one time then to move the same box up a(n) _____ sloped inclined plane.

10. As you increase the _____ on a screw type of inclined plane, you will also need to increase the force.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. What does the mechanical advantage of a screw type of inclined plane depend on?
   a) size b) length c) thickness d) pitch
2. If a three pound box is lifted vertically for two feet without an inclined plane, how much overall work was done in the total process (in foot pounds)?
   a) 5 b) 6 c) 1 d) 0
3. Which requires the most overall effort to raise a thirty pound box ten feet?
   a) a rough inclined plane b) a smooth inclined plane c) vertically lifting with no inclined plane d) no difference
4. Which requires the least amount of overall effort to raise a thirty pound box ten feet?
   a) a rough inclined plane b) a smooth inclined plane c) vertically lifting with no inclined plane d) no difference
5. If you wanted to raise a heavy box, which method would you use to have the least amount of effort at any one time ?
   a) a rough inclined plane b) a smooth inclined plane c) vertically lifting with no inclined plane d) no difference

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. By using an inclined plane, you can always decrease the total effort needed to do a job.

___ 2. A long wedge has a greater mechanical advantage then a short wedge of the

same pitch.

___3. A thin wedge has a greater mechanical advantage then a thick wedge of the same pitch.

___4. Friction makes work easier.

___5. Machines such as wedges and screws allow work to be done with less *total* effort.

___6. The pitch of a screw can change its mechanical advantage.

___7. Inclined planes were probably used by the Egyptians to lift heavy rocks to build pyramids.

___8. More *total* work is required when using an inclined plane because of friction between an object and the inclined plane.

___9. The same amount of work is always done whether you use an inclined plane or not.

___10. Nature does not use inclined planes, because only man can invent machines that make work easier.

Biological Science: Lesson 15

Can You Lift It?
(Pulleys, Mechanical Advantage)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___1. a grooved wheel supported in a frame
___2. a reduction of effort needed at any one time
___3. a pulley that changes direction but not effort
___4. one or more pulleys in the same frame
___5. a pulley that gains mechanical advantage
___6. two or more blocks connected by rope
___7. reason for difference between theoretical and actual mechanical advantage

A. block
B. block and tackle
C. fixed pulley
D. friction
E. mechanical advantage
F. movable pulley
G. pulley

II. ***Fill in the blank*** with the word from the following list.

block and tackle	direction	fixed
forty	less	mechanical advantage
more	movable	one thousand
ten		

1. Pulleys can make lifting easier by changing the _____ of force and by gaining _____.

2. A _____ pulley can be used to gain a mechanical advantage.

3. If you wanted to lift a heavy weight and change the direction of force but not the mechanical advantage, you could use a single _____ pulley.

4. By using two movable pulleys and two fixed pulleys, _____ feet of rope would have to be pulled to lift a heavy weight ten feet.

5. By using a fixed pulley, ten feet of rope would have to be pulled to lift an object _____ feet.

6. If rope is used to connect three blocks together, you have a _____ type of pulley.

7. If a pulley system gives a mechanical advantage of four, then _____ pounds of force would be needed to lift a 4,000 pound car.

8. If a fixed pulley system has a lot of friction, then the amount of effort needed to lift a heavy weight will be _____ than the theoretical effort.

9. With all other factors being equal, a movable pulley with mechanical advantage of four always requires _____ effort than a fixed pulley system.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. While using a movable pulley, what will happen to the overall effort needed to lift an object?
   a) increase b) decrease c) no difference d) increases, but not measurably
2. By using a block and tackle system like the one shown in figure 15.3 of the text, how many pulleys could you use to change the direction of force?
   a) two b) three c) five d) no number of pulleys will change the direction
3. How many pounds could you lift with a movable pulley system with a mechanical advantage of four, if you could lift 200 pounds without the help of the pulleys?
   a) 50 b) 200 c) 800 d) 2000
4. Which of the following is NOT true about pulleys?
   a) change direction of force b) reduce effort at any one time c) reduce overall effort d) pulleys have no uses
5. Which of the following pulleys would make lifting a heavy object the easiest?
   a) fixed pulley b) movable pulley with mechanical advantage of two c) movable pulley with mechanical advantage of four d) no difference

V. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___1. Fixed pulleys can change the direction of the force.
___2. Mechanical advantage results from using a fixed pulley.
___3. A block and tackle system can change the direction of force.

___4. More effort at a given time is needed to lift a weight as the mechanical advantage of the pulley system is increased.

___5. By using fewer ropes, you can increase your mechanical advantage.

___6. Approximately 100 feet of rope are needed to raise an object 100 feet in the air by using a movable pulley with a mechanical advantage of two.

Biological Science: Lesson 16

Three of a Kind (Levers)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___1. machine probably used to help lift rocks for pyramids
___2. distance from resistance to the fulcrum
___3. energy used to move the lever
___4. distance from effort to the fulcrum
___5. a lever with the fulcrum between effort and resistance
___6. lever that always gives mechanical advantage
___7. object that you are trying to move
___8. anything that can be used as a pivot point
___9. type of lever with resistance arm longer than the effort arm
___10. the long stick-like part of a lever

A. arm
B. class I lever
C. class II lever
D. class III lever
E. effort
F. effort arm
G. fulcrum
H. lever
I. resistance
J. resistance arm

II. ***Fill in the blank*** with the word from the following list.

arm	always	distance
effort	fulcrum	longer
more	never	one
resistance	second	

1. The two main parts of a lever are the _____ and _____.

2. The _____ class lever has the fulcrum under it, and the resistance between the effort and the fulcrum.

3. To change the direction of effort, class _____ levers can be used.

4. The shorter the effort arm of the lever, the _____ effort is needed to lift a

heavy object.

5. Mechanical advantage is gained if the _____ arm is longer than the _____ arm.

6. Mechanical advantage is _____ gained in a class II lever.

7. Whenever a lever is used to gain mechanical advantage, _____ is lost in the process.

8. Class III levers have a resistance arm that is _____ than the effort arm.

9. Mechanical advantage is _____ gained in a class III lever.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. Which class of lever can never give you a mechanical advantage?
   a) I b) II c) III d) all classes
2. If you wanted to change the direction of effort, which lever would you use?
   a) I b) II c) III d) no lever changes effort direction
3. What amount of effort, in pounds, would you need to lift a fifty pound object with a resistance arm of five feet and an effort arm of ten feet?
   a) 25 b) 50 c) 75 d) 100
4. If the resistance is moved toward the point of effort on a lever, and the amount of effort increases, which type of lever are you using?
   a) I b) II c) III d) any type
5. If the point of effort is moved toward the fulcrum, and the amount of effort needed to lift increases, which type of lever are you using?
   a) I b) II c) III d) any type

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___1. Since class III levers never give mechanical advantage, they are not useful.
___2. If the effort arm is shorter then the resistance arm, then you loose mechanical advantage.
___3. The longer the effort arm, the more mechanical advantage is gained.
___4. If a lever gains lifting distance, then it must also gain mechanical advantage.
___5. One way to decrease the effort needed to move a heavy weight is to decrease

the resistance arm.

___6. A fly swatter is an example of a class II lever.

___7. By using a wheelbarrow, you are using a class I lever.

___8. A crow-bar is a simple class I lever.

Biological Science: Lesson 17

Where Is the Big Wheel? (Wheel and Axle)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___1. machine where axle is firmly attached to the wheel
___2. where to apply effort to gain force
___3. a simple example of a wheel and axle
___4. can be used to connect wheels and axles
___5. where to apply effort to gain speed or distance
___6. machine with two or more simple machines

A. belts and chains
B. compound machine
C. door knob
D. large wheel
E. small wheel
F. windlass

II. ***Fill in the blank*** with the word from the following list.

axle	decrease	increase
knob	larger	mechanical advantage
size	smaller	speed
spinning top	wheel	

1. To construct a windlass, you must have the _____ firmly assembled to a _____.
2. A wheel and axle system can be used to gain _____ or _____.
3. Mechanical advantage is gained when effort is placed on the _____ wheel of a windlass.
4. When effort is placed on the _____ wheel of a wheel and axle system, speed or distance is gained.
5. The greater the difference in _____ between the large wheel and axle, the greater the gain in mechanical advantage or speed/distance.

6. A _____ is an example of a windlass system that gains mechanical advantage.

7. An example of a wheel and axle system that gains speed or distance is a _____.

8. If you wanted to construct a windlass with a large mechanical advantage, you could _____ the radius of the axle or _____ the radius of the large wheel.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. If in a windlass system, the large wheel radius was exactly equal to the radius of the axle, what would the mechanical advantage be equal to?
   a) zero b) one c) two d) three
2. If you apply effort to a stereo's volume knob, what do you gain?
   a) speed or distance b) resistance c) nothing d) mechanical advantage
3. When effort is applied to the shaft of a helicopter to make the blade spin, which of the following is gained?
   a) speed or distance b) resistance c) nothing d) mechanical advantage
4. What is the mechanical advantage of a windlass if its resistance arm radius is four inches and its wheel radius is one inch?
   a) 1/4 b) 1/2 c) 2 d) 4
5. If you wanted to select a windlass that would give the most speed or distance for a given amount of effort, what mechanical advantage would your windlass have?
   a) 4 b) 2 c) 1 d) 1/2

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___1. Using a high gear on a bicycle is an example of using effort to gain speed.
___2. Most compound machines use at least one wheel within their system.
___3. A typical windlass is designed so that the wheel is allowed to rotate about an axis.
___4. By applying effort to a wheel and axle system, force can be used to gain both mechanical advantage and speed.
___5. Mechanical advantage is determined in a windlass based on the size difference

between the large wheel and axle.

___6. A wheel and axle system is a "first class" lever with the fulcrum positioned at the common center.

___7. The complexity of the wheel and axle system make it a machine that only man can use for his benefit.

Biological Science: Lesson 18

High or Low? (Siphons, Barometers, Air Pressure)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___ 1. a substance much denser than water and sometimes used in barometers
___ 2. lower air pressure causes . . .
___ 3. invented the barometer
___ 4. the atmosphere extends at least how many miles above the earth?
___ 5. air is made of this
___ 6. because of this we are not floating around in space
___ 7. as you go higher in elevation air gets . . .
___ 8. something we use to get liquid from a higher elevation to a lower one
___ 9. surrounds the entire earth and is made up of several layers
___ 10. the way we actually use this device has fooled many people

A. 500
B. siphon
C. Sir Issac Newton
D. warm front
E. gravity
F. mercury
G. atmosphere
H. cold front
I. straw
J. thinner
K. Torricelli
L. molecules
M. 2000

II. ***Fill in the blank*** with the word from the following list.

atmospheric pressure	barometer	gravity	Torricelli's
molecules	atmosphere	siphon	dense
aneroid barometer	air		

1. The fog was very _____ and hard to see through.
2. Because of _____ knowledge of air pressure, today we are able to understand it much better.

3. _____ is caused by the upper layers of the atmosphere pushing down on the lower ones.
4. Very, very small particles that make up different things such as air are called _____.
5. _____ is what keeps everything from floating around in space.
6. A _____ is used to measure the atmospheric pressure.
7. _____ is essential to life and is found all around us.
8. Tom used a _____ to get the gas out of the tank of his car after he realized he had put the wrong kind in.
9. A(n) _____ does not use liquid and can be very accurate when measuring the atmospheric pressure.
10. The _____ is made up of air that surrounds the earth.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. An aneroid barometer is made up of . . .
   a) mercury b) water c) a vacuumed box d) air
2. When a high pressure mass of cool air moves into an area of lower pressure, a cold front is formed producing . . .
   a) sunshine b) rain c) light showers d) winter
3. Air that is warming becomes less dense and causes the barometer to . . .
   a) drop b) rise c) stay the same d) break
4. As you walk or drive up a mountain the air pressure . . .
   a) increases b) becomes cooler c) becomes warner d) decreases
5. Most of the air in the atmosphere is within how many miles of the earth's surface?
   a) 50 b) 2000 c) 500 d) 20

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. You could use water instead of mercury to make a barometer.
___ 2. Normal air pressure can only support a column of water that is about 40 feet tall.
___ 3. Because air pressure increases as you increase elevation, there are some interesting things that happen on mountain tops.

___ 4. A siphon is a tube that can be used to move a liquid from a higher to a lower level.
___ 5. Air pressure has a force of about 14.7 pounds per square inch.
___ 6. A scientist by the name of Torricelli suggested that there are several layers of air.
___ 7. Mercury is about 14 times less dense than water.
___ 8. A Mercury barometer is the most convenient type of barometer there is.
___ 9. A warm front is produced when a low pressure area moves into an area of high pressure.
___ 10. Nose bleeds are a result of increased air pressure.

Biological Science: Lesson 19

Don't Blow Your Fuse (Fuses, Electricity)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___ 1. a type of electricity found in most homes
___ 2. friction on the wire that is transporting electricity is called
___ 3. this will probably be needed after severe electrical shock
___ 4. a type of safety device that will need to be replaced after a circuit is overloaded
___ 5. a circuit is rated by its number of . . .
___ 6. the flow of electric energy
___ 7. can be deadly when careless with electricity
___ 8. electricity travels through a pass called . . .
___ 9. when a wire gets red hot and melts or burns its insulation, it . . .
___10. A circuit breaker unlike a fuse uses a . . .

A. amperes
B. electric shock
C. magnet
D. CPR
E. electricity
F. circuit
G. resistance
H. fuse
I. overheats
J. alternating current

II. ***Fill in the blank*** with the word from the following list.

electric shock	alternating current	transmission	fuse
circuit breaker	CPR treatment	short circuit	
electricity	circuit	amperes	

1. Keeping an extension cord hidden under a rug is not a very safe idea because it may _____.
2. Jessica had too many things plugged into an outlet blowing a _____; it will now need to be replaced.

3. If a person has stopped breathing because of electrical shock, _____ should be given immediately and help should be called.
4. The entire course traveled by an electric current is called a _____.
5. A circuit is rated by the number of _____ of current that can travel on that wire without causing an overload.
6. To send from one place to another is known as _____.
7. A(n) _____ is a type of electricity that is found in most homes.
8. _____ is very, very dangerous and possibly deadly if safety precautions are not taken.
9. _____ is the flow of electric particles that is used as a source of power or energy.
10. A safety device that does not need to be replaced every time a circuit overloads is a(n) _____.

III. In these ***multiple choice*** questions choose the correct an

1. Which of the following wires can handle a larger current?
   a) 20 gauge b) 14 amp c) 12 gauge d) 10 amp
2. A 60 watt light bulb has how many amperes?
   a) .60 b) .545 c) 20 d) 110
3. When the main flow of electricity does not go through the intended location we call this?
   a) short circuit b) overload c) circuit breaker d) fuse
4. If a circuit has 20 ampere fuse, how many actual amperes does it have?
   a) 10 b) 15 c) 20 d) 25
5. Which type of safety device needs to be replaced after a circuit is overloaded?
   a) circuit breaker b) ampere c) fuse d) short circuit

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. The size of a wire can carry the same amount of current. For example, 20 gauge wire can safely carry 20 amps of current.
___ 2. The number of appliances on a circuit is not necessarily the cause of it to

become overloaded.

___ 3. It is impossible to determine the ampere of an appliance if it is not on the label.

___ 4. Experiments are now being done that use very cold wires to transport electricity.

___ 5. One of the most common problems relating to electricity is that of an overloaded circuit.

___ 6. A penny is okay to use if a fuse needs to be replaced.

___ 7. A 12 gauge wire can carry more current than a 10 gauge wire.

___ 8. The colder a wire is the less resistance there is for electricity to move over that wire.

Biological Science: Lesson 20

A Shocking Experience (Wet and Dry Cell, Static Electricity)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___1. instrument to measure electrical current	A. ammeter
___2. voltaic cell that has no liquid	B. battery
___3. current with electrons moving in only one direction	C. direct current
___4. a device that makes electricity from chemical energy	D. dry cell
___5. subatomic particles with no net charge	E electricity
___6. large amount of charge that accumulates on objects	F. molecules
___7. movement of electrons through a conductor	G. neutrons
___3. two or more cells connected together	H. static electricity
___9. smallest particle of matter that still has chemical properties of the substance	I. voltaic cell

II. ***Fill in the blank*** with the word from the following list.

acid	chemical	copper
electrical	electrons	metals
neutrons	opposite	protons
static electricity	wet cell	zinc

1. An atom can become negatively charged by gaining _____ and/or loosing _____.

2. _____ can be absorbed by an atom while not changing the particles' overall charge.

3. Two particles with _____ charges will attract each other.

4. _____ results when a huge charge is collected on a material.

5. A voltaic cell could be set up with two different _____ and a solution of _____.

6. A voltaic cell makes electricity by changing _____ energy into _____ energy.

7. A voltaic cell is an example of a _____.

8. Two common metals used in a voltaic cell are _____ and _____.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. An atom can become positively charged by which of the following ways?
   a) gaining neutrons b) losing neutrons c) losing electrons
   d) losing protons
2. When zinc and copper are assembled in a voltaic cell, what direction do the electrons flow?
   a) copper to zinc b) zinc to copper c) both ways d) do not flow
3. If electrons and protons each carry equal charge, and a certain neutral atom gains three protons and four electrons, what is its overall charge?
   a) negative four b) negative one c) zero d) positive one
4. In a voltaic cell, which of the following types of electricity is produced?
   a) direct current b) alternating current c) alternating and direct current
   d) no current is produced
5. What will tend to happen with two objects that have the same type of charge?
   a) attract b) repel c) depends on the amount of charge d) nothing

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___1. One way to reduce static charge is to lower the humidity.
___2. When an atom looses electrons, it becomes more positively charged.
___3. Voltaic cells produce alternating current.
___4. A voltaic cell uses two pieces of the same type of metal.
___5. Different combinations of metal produce different amounts of current in a voltaic cell.
___6. In a voltaic cell, the strength of the acid will not effect the amount of current

that is produced.

___7. Since the initial invention of the battery, its basic design has changed little.

___8. Dry cells use pastes which contain metal in the paste rather then in liquids.

Biological Science: Lesson 21

Speed It Up
(Speed, Motion, Momentum and Acceleration)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___1. rate of motion
___2. objects at rest tend to remain at rest unless acted on by a force
___3. tendency of an object to keep its present state of motion
___4. instrument that measures speed
___5. quantity defined as total distance divided by total time
___6. gain in speed per unit of time
___7. instrument to measure distance
___8. quantity defined as object's mass times its velocity
___9. every force has an equal and opposite force
___10. quantity of motion that contains direction and speed

A. acceleration
B. average speed
C. 1st law motion
D. inertia
E. momentum
F. odometer
G. speed
H. speedometer
I. 3rd law motion
J. velocity

II. ***Fill in the blank*** with the word from the following list.

conserved	direction	equal
force	greater	lighter
momentum	opposite	second law motion
uniform		

1. Objects that are in motion tend to remain in motion unless acted upon by a _____.

2. _____ states that as the amount of force producing the acceleration increases, so does the acceleration.

3. If two cars are moving with the same velocity, then the _____ car will have

less momentum.

4. Whenever a pool ball collides with other balls, then the total amount of momentum before and after the collision is _____.

5. When you jump into the air, the force that you exert on the earth is _____ and _____ to the force that the earth exceeds on you.

6. Velocity is different from speed because velocity considers the _____ of motion.

7. If a ball increases its speed by the same amount every second, then the ball's acceleration can be described as _____.

8. All moving objects have _____, but for this quantity to be equal, lighter objects must have a _____ velocity.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. If the velocity of a train at one instant is 25 ft/sec., and 1 second later its velocity is 40 ft/sec., then what is the uniform acceleration of the train (units will be in ft/sec. per sec.)?
   a) zero b) 5 c) 10 d) 15
2. If a ball has a velocity of 100 meters/sec and mass of 1 kg and it stops after hitting another 1 kg ball, what is the seconds ball's final speed if momentum is conserved?
   a) zero b) 100 m/s c) 150 m/s d) not enough information
3. What would your average speed need to be in order to travel 200 miles in 4 hours?
   a) 25 mph b) 50 mph c) 100 mph d) 200 mph
4. Which law of motion states that for every force there is an equal and opposite force?
   a) no law b) first law c) second law d) third law
5. Which of the following concepts of motion does NOT take direction into consideration?
   a) speed b) momentum c) acceleration d) velocity

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___1. Uniform acceleration means that an object never gains speed.
___2. All moving objects have momentum.
___3. When a force acts on an object, the momentum of the object changes.
___4. Velocity and speed always describe the same physical situation.
___5. Inertia describes the tendency of an object to keep its present state of motion.
___6. A heavy object can have the same amount of momentum as a light object.
___7. An object's motion is effected by the length of time that a force stays in contact with the object.
___8. Speedometers measure speed and distance.
___9. Laws of motion can be used to find some information, but they are not useful in every day life.

Biological Science: Lesson 22

Falling Apples (Motion, Gravity)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___1. force which pulls all objects toward each other
___2. different motions considered separately to find their combined effect
___3. the apparent force that pulls objects from a center
___4. motions that occurs when an object moves back and forth over the same path in equal time frames
___5. time pendulum takes to swing back and forth one time
___6. motion in straight line to a circle
___7. weight suspended at end of a pendulum

A. bob
B. centripetal force
C. gravity
D. period
E. periodic
F. relative motion
G. tangent

II. ***Fill in the blank*** with the word from the following list.

centripetal force	close	distance
far	large	lengthened
mass	periodic motion	relative motion
small	tangent	uniform

1. The force of gravity depends on the _____ of two objects and the _____ between them.

2. An object with a _____ mass will exert more of a gravitational force then an object with a _____ mass.

3. A _____ object will be less effected by gravity then a _____ object.

4. One consequence of _____ acceleration of gravity, is that all objects fall equally fast without air resistance.

5. _____ says that any two forces acting on an object have no direct effect on each other.

6. In order to increase the period of a pendulum, the pendulum support should be _____.

7. An object, such as a guitar string, that moves or vibrates back and forth over a given path in equal time frames is in _____.

8. _____ is the apparent pull away from the center of motion.

9. Inertia causes objects to move in a straight line _____ to a circle.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. If a hunter is aiming at a monkey in a tree, and the monkey suddenly drops out of the tree, when should the hunter shoot if he keeps the gun aimed in the original spot?
   a) immediately b) when monkey hits ground c) when monkey is half way down d) cannot tell since gravity is non-uniform
2. The idea that many forces acting on an object can be treated separately without effecting each other is an example of which of the following?
   a) periodic motion b) circular motion c) relative motion d) cannot separate forces
3. If a grandfather clock, which operates by a pendulum, is running slow, what must you do to the pendulum length to correct its time?
   a) lengthen b) shorten c) nothing d) changing length has no effect
4. When a marble, which was rolled around a sharp curve to the right, leaves the curve, in what direction will it tend to travel?
   a) right b) left c) cannot tell d) straight
5. The Earth's gravitational force on a space ship can be reduced by which of the following?
   a) moving the object closer b) increasing the mass of the ship
   c) increasing the mass of the earth d) decrease the mass of the ship

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___1. Centripetal force is an actual force that pushes objects out from the center of

motion.

___2. Gravity can act only between two objects.
___3. The acceleration due to gravity on earth is very close to being uniform.
___4. Gravitational forces from other planets are the same as on earth.
___5. A small pebble exerts a gravitational force on a large rock.
___6. No object is ever pulled by more then one gravitational force at a time.
___7. The length of a pendulum cannot effect the period of the pendulum.
___8. Objects traveling in circular motion tend to exhibit tangential motion.

Biological Science: Lesson 23

Saving Energy and Money (Energy Conservation)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___ 1. insulation is usually measured by its . . .
___ 2. used to keep air and rain out of a home
___ 3. if not careful woodburners can be a . . .
___ 4. having your furnace cleaned is a good way to . . .
___ 5. windows have how much insulating quality?
___ 6. energy used to keep your house warm is measured by?
___ 7. the use of a(n) _____ will help cut costs by saving energy at night
___ 8. having one of these can waste a lot of precious energy if proper devices are not used
___ 9. wood or metal that helps cut down on cold air from coming into your warm home
___10. used to prevent loss of heat

A. save money
B. electric blanket
C. British Thermal Unit
D. zero
E. insulation
F. fireplace
G. caulking
H. ten
I. R-value
J. fire hazard
K. weatherstripping

II. ***Fill in the blank*** with the word from the following list.

payback period	thermostat	weatherstripping	energy
caulking	furnace	insulate	conservation
R-value	BTU		

1. It is important to _____ in order to cut down on the loss of heat energy.
2. Depending on how much you spread out your investment to make your home more energy efficient will determine when your _____ will begin.
3. Using an extra blanket or two at night and turning your _____ back will help cut your heating bills.

4. _____ is a way of measuring energy.
5. Some people use _____ to keep cold air from seeping in through loose window seals.
6. Depending on how much you want to insulate something in your home will determine the _____ you use.
7. _____ is very important if you are trying to save money.
8. The use of a narrow strip of wood or metal between a door or window to keep out cold air is called _____ ____ .
9. The _____ is usually found in the basement of a house and the heat is usually transported by vents.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. Which of the following is not an example of energy conservation?
   a) caulking b) R-value c) weatherstripping d) insulation
2. Which type of light bulb uses less energy?
   a) 40 watt b) 100 watt c) fluorescent d) Christmas lights
3. Which of the following does not help you keep warm in the winter?
   a) alcohol b) long underwear c) physical exercise d) electric blanket
4. What would be the best economical way to heat your home in the winter?
   a) gas heat b) wood burner c) fireplace d) sun
5. If a person decides to insulate his home and wants to buy the best insulation he can, which of the following would he purchase?
   a) R-14 b) BTU-4 c) R-36 d) BTU-20

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. A good way to save money is to have your furnace cleaned.
___ 2. The only drawback to using caulking is it is expensive.
___ 3. In Pennsylvania, heating a house or an apartment is usually the largest single use of energy.
___ 4. Insulation with an R-value of 25 is pretty good insulation.
___ 5. Fireplaces are very economical and cost you very little energy.
___ 6. If a TV has 3 amps then it has 500 watts.
___ 7. If you insulate the inside of your hot water tank, this will keep heat inside the tank and save you money.

___ 8. Wood burning stoves can save you money, however, if not carefully installed they can be a fire hazard.

Biological Science: Lesson 24

Kitchen Chemistry (Fire, Bleach, Boiling Point)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___1. good to have around for grease fires
___2. boils when its temperature reaches -184 degrees C.
___3. fire is a . . .
___4. frequently used when doing home canning
___5. the changing of a liquid into a gas
___6. used to remove stains
___7. a material that burns at a very low temperature
___8. an example of combustion
___9. modern day flint and pyrite
___10. it is 75°F on a warm day; what degree Celsius is it?

A. phosphorus sulfide
B. pressure cooker
C. 21°C
D. bleach
E. candle light
F. baking soda
G. chemical reaction
H. evaporation
I. oxygen
J. 10°C
K. matches

II. ***Fill in the blank*** with the word from the following list.

pressure cooker	boiling point	Lavoisier	phosphorous sulfide
evaporation	combustible	bleaching	Celsius
oxygen	flint	boiling	pyrite
chemistry			

1. Without _____ it would be impossible to make fires and most importantly there would be no life on earth.

2. _____ burns at a very low temperature and is a material used in making matches.

3. A _____ would be very useful at higher elevations.
4. A very hard rock that is used to start fires is called _____.
5. After Sue finished _____ her shoes they looked like new.
6. Gas is very _____ and a person should never smoke while around it.
7. Some students think _____ is very hard, however, most enjoy the labs they get to do.
8. _____ had a great influence in the field of chemistry.
9. Most people don't like using the _____ scale because they are used to Fahrenheit.
10. After the _____ of water is reached it will not get any hotter.
11. Boiling water is a great example of _____.
12. _____ is a soft rock that was used in helping create fires before there were matches.
13. _____ is the process of exploding bubbles in water due to heat.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. Convert 10°C into a Fahrenheit reading. What is the Fahrenheit temperature?
   a) 90°F b) 40°F c) 20°F d) 100°F
2. Which of the following should you not use on a grease fire?
   a) baking soda b) flour c) water d) dirt
3. At 14,000 feet air pressure is much less than at sea level, therefore, water will boil at . . .
   a) a higher temp. b) the same temp. c) will not boil d) at a lower temp.
4. Certain chemicals can be very dangerous when mixed together; which of the following can cause this type of reaction?
   a) zinc and sulfide b) ammonia and chlorine c) phosphorous and zinc
   d) potassium and sulfide
5. Convert 40°F into a Celsius reading. What is the Celsius temperature?
   a) 20°C b) 4°C c) 10°C d) 80°C

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___ 1. It is a misconception that fire is a chemical reaction.
___ 2. All liquids have the same boiling point.
___ 3. Prior to the 1800's, there was no easy way to start a fire.
___ 4. Water is the only thing that puts out any type of fire.
___ 5. Sometimes two chemicals can interact with each other and become dangerous.
___ 6. 30°C = 86°F
___ 7. Fire is not possible without oxygen.
___ 8. Pressure cookers have no use unless they are used at a higher elevation.

Biological Science: Lesson 25

Are You Cool? (Evaporation)

I. ***Match*** the words on the right with the correct phrases on the left by placing the correct letter in the blank space.

___1. process of liquid turning into a gas	A. evaporation
___2. form of energy that can cause evaporation	B. gas
___3. natural human process to cool the body temperature	C. heat
___4. state of matter where the substance can be easily poured	D. liquid
___5. instrument used to measure the amount of "heat"	E. panting
___6. process dogs use to cool their bodies	F. sweating
___7. state of matter where the substance is widely dispersed	G. thermometer

II. ***Fill in the blank*** with the word from the following list.

energy	evaporation	faster
gases	heat	liquids
temperature		

1. When a liquid turns into a gas _____ has taken place.
2. Because water, gasoline, and syrup can be poured, they are considered to be _____.
3. _____ such as air, oxygen, nitrogen, and water vapor are very widely scattered and they cannot be poured.
4. When _____ is added to a liquid, usually some of the liquid evaporates into a gas.
5. Because alcohol evaporates faster then water, it cools your body _____ in a given unit of time.
6. One easy way to increase the rate of evaporation is to increase the _____.

7. Evaporation requires _____.

III. In these ***multiple choice*** questions choose the correct answer. Circle its letter.

1. If you place a cup of alcohol in the sun and an equal cup of alcohol in a refrigerator, which will evaporate quicker if everything else is held constant?
   a) cup in sun b) cup in refrigerator c) both cups same d) cannot determine
2. Which of the following describe evaporation?
   a) changes a gas to liquid b) produces energy c) produces heat d) requires energy
3. In the experiment described in "something to try," which thermometer would read lower several seconds after removing the two thermometers from the two liquids?
   a) water b) alcohol c) same d) cannot determine
4. Which of the following is a natural reason for the body to perform the process of evaporation?
   a) heating b) losing water c) appearance d) cooling

IV. In the blanks below, write T if the sentence is ***true*** and F if the sentence is ***false***.

___1. When water evaporates, some of the water molecules are "lost" forever.
___2. Evaporation is a warming process.
___3. Evaporation is a process that changes a liquid into a gas.
___4. The faster a liquid evaporates, the more heat it takes from your skin in a given unit of time.
___5. Water evaporates faster then alcohol.
___6. Heat is given off when certain liquids are evaporated.
___7. When solid substances, such as ice, melt then they have evaporated.
___8. Thermometers measure the presence or absence of "heat."

PRE-TEST

BASIC SCIENCE LIVING SKILLS FOR TODAY'S WORLD

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Organization:	ADULT EDUCATION SERVICES Dr. Robert W. Zellers, President 313 Gardner Street Johnstown, PA 15905
Project Director:	Dr. Robert W. Zellers Education Division 114 Biddle Hall University of Pittsburgh at Johnstown Johnstown, PA 15904
Materials may be borrowed through:	AdvancE The Adult Education Clearinghouse PDE Resource Center Pennsylvania Department of Education 333 Market Street Harrisburg, PA 17127-0333

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Select the correct answer by placing the appropriate letter on the answer sheet.

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   a) fluid b) water c) sound waves d) energy

2. The vibration of the eardrum causes some very small bones in the middle part of the ear to?

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3. Impulses travel from the nerve to the?

   a) ear b) eye c) nose d) brain

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   a) better standard of living b) improved diet
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7. To approximately what age can we expect to live to today?

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9. An example of an illness caught by breathing in germs from the air.

   a) sunstroke b) gonorrhea c) polio d) flu

10. A medicine containing antibodies that will help fight germs.

a) chemotherapy b) vaccination c) cough syrup d) serum

11. You just ate a piece of pizza with extra cheese which was about 500 calories; of the following exercises which would most likely burn off those calories if done for an hour?

a) playing the piano b) walking c) ironing d) swimming

12. A healthy diet should always include the following except

a) low fat milk b) lean meat or fish c) fried foods
d) fruits and vegetables

13. Out of the following foods which contains the least amount of calories?

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14. Which of the following is NOT needed for growth?

a) oxygen b) surface area c) time d) excess waste

15. If a cell has an original radius of one unit and later grows to a radius of three units, then which of the following is true?

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a) grows into a large fluke b) it dies if not eaten by a sheep
c) it turns into a water creature d) it produces more larvae

19. There are how many pairs of chromosomes in each body cell?

a) 32 b) 46 c) 23 d) 21

20. About how many males are born compared to females?) NOT CLEAR

a) 75% b) 50% c) 25% d) 60%

21. Many birds have one eye on each side of its head EXCEPT which one of the following who is a noticeable exception?

a) robin b) sparrow c) owl d) hawk

22. Birds have an angular body that helps them cut through the air, this is known as

a) split b) gliding c) membrane d) streamlines

23. How can birds fly at speeds of 40-60 miles per hour without losing their vision?

a) instinctive sense of direction b) third eyelid c) goggles d) split eye

24. Mary is a hungry three year old child. She sees candy in a jar on the counter. She cannot reach it because she is too short. She is able to reach the candy by pulling a chair over to the counter. She then climbs onto the chair and finally onto the counter top. What type of behavior did the girl show?

a) reflex b) learned c) instinct d) problem solving

25. A farmer keeps a duckling away from its mother for the first 16 hours of life. Instead, the duckling is placed with a nest of geese. To who (or what) will the duckling imprint?

a) father duck b) mother duck c) geese d) farmer

26. When an electrical storm is moving quickly toward us as we are swimming on a beach, we should do what?

a) stay in the water b) do not move from the area c) scream and cry
d) go to a car or building

27. How many feet per second does sound travel at 70° F?

a) 1,090 b) 1,132 c) 1,160 d) 1,120

28. Watching for lightning and listening for the thunder are good ways to do what?

a) guess the distance of a storm b) make sure your senses are working
c) spend a night with the family d) predict tomorrow's weather

29. When you drive down an icy road in the winter, what type of anti-skid material might you find on the road?

a) salt b) sand c) gravel d) all of the above

30. The best way to tell if your car's radiator needs more antifreeze is by using which of the following instruments?

a) thermometer b) thermostat c) barometer d) hydrometer

31. We use water power to make electricity. One way to do this is by using a

a) river b) dam c) ocean d) water tower

32. About 65% of your body's weight is water. If you weigh 120 pounds, how many of those pounds are water?

a) 98 b) 33 c) 56 d) 78

33. Which of the following can survive without water?

a) humans b) sunflowers c) camels d) limestone

34. If a three pound box is lifted vertically for two feet without an inclined plane, how much overall work was done in the total process (in foot pounds)?

a) 5 b) 6 c) 1 d) 0

35. Which requires the least amount of *overall* effort to raise a thirty pound box ten feet?

a) a rough inclined plane b) a smooth inclined plane
c) vertically lifting with no inclined plane d) no difference

36. While using a movable pulley, what will happen to the *overall* effort needed to lift an object?

a) increase b) decrease c) no difference d) increases, but not measurably

37. How many pounds could you lift with a movable pulley system with a mechanical advantage of four, if you could lift 200 pounds without the help of the pulleys?

a) 50 b) 200 c) 800 d) 2,000

38. Which of the following pulleys would make lifting a heavy object the easiest?

a) fixed pulley b) movable pulley with mechanical advantage of two
c) movable pulley with mechanical advantage of four d) no difference

39. If you wanted to change the direction of effort, which lever would you use?

a) I b) II c) III d) no lever changes effort direction

40. If the resistance is moved toward the point of effort on a lever, and the amount of effort increases, which type of lever are you using?

a) I b) II c) III d) any type

41. If in a windlass system, the large wheel radius was exactly equal to the radius of the axle, what would the mechanical advantage be equal to?

a) zero b) one c) two d) three

42. When effort is applied to the shaft of a helicopter to make the blade spin, which of the following is gained?

a) speed or distance b) resistance c) nothing d) mechanical advantage

43. If you want to select a windlass that would give the most speed or distance for a given amount of effort, what mechanical advantage would your windlass have?

a) 4 b) 2 c) 1 d) 1/2

44. When a high pressure mass of cool air moves into an area of lower pressure, a cold front is formed producing . . .

a) sunshine b) rain c) light showers d) winter

45. As you walk or drive up a mountain the air pressure . . .

a) increases b) becomes cooler c) becomes warmer d) decreases

46. Which of the following wires can handle a larger current?

a) 20 gauge b) 14 amp c) 12 gauge d) 10 amp

47. When the main flow of electricity does not go through the intended location we call this?

a) short circuit b) overload c) circuit breaker d) fuse

48. Which type of safety device needs to be replaced after a circuit is overloaded?

a) circuit breaker b) ampere c) fuse d) short circuit

49. When zinc and copper are assembled in a voltaic cell, what direction do the electrons flow?

a) copper to zinc b) zinc to copper c) both ways d) do not flow

50. In a voltaic cell, which of the following types of electricity is produced?

a) direct current b) alternating current c) alternating and direct current d) no current is produced

51. If the velocity of a train at one instant is 25 ft/sec., and 1 second later its velocity is 40 ft/sec., then what is the uniform acceleration of the train (units will be in ft/sec. per sec.)?

a) zero b) 5 c) 10 d) 15

52. What would your average speed need to be in order to travel 200 miles in 4 hours?

a) 25 mph b) 50 mph c) 100 mph d) 200 mph

53. Which of the following concepts of motion does NOT take direction into consideration?

a) speed b) momentum c) acceleration d) velocity

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55. When a marble, which was rolled around a sharp curve to the right, leaves the curve, in what direction will it tend to travel?

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POST-TEST

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24. Mary is a hungry three year old child. She sees candy in a jar on the counter. She cannot reach it because she is too short. She is able to reach the candy by pulling a chair over to the counter. She then climbs onto the chair and finally onto the counter top. What type of behavior did the girl show?

a) reflex b) learned c) instinct d) problem solving

25. A farmer keeps a duckling away from its mother for the first 16 hours of life. Instead, the duckling is placed with a nest of geese. To who (or what) will the duckling imprint?

a) father duck b) mother duck c) geese d) farmer

26. When an electrical storm is moving quickly toward us as we are swimming on a beach, we should do what?

a) stay in the water b) do not move from the area c) scream and cry d) go to a car or building

27. How many feet per second does sound travel at 70° F?

a) 1,090 b) 1,132 c) 1,160 d) 1,120

28. Watching for lightning and listening for the thunder are good ways to do what?

a) guess the distance of a storm b) make sure your senses are working c) spend a night with the family d) predict tomorrow's weather

29. When you drive down an icy road in the winter, what type of anti-skid material might you find on the road?

a) salt b) sand c) gravel d) all of the above

30. The best way to tell if your car's radiator needs more antifreeze is by using which of the following instruments?

a) thermometer b) thermostat c) barometer d) hydrometer

31. We use water power to make electricity. One way to do this is by using a

a) river b) dam c) ocean d) water tower

32. About 65% of your body's weight is water. If you weigh 120 pounds, how many of those pounds are water?

a) 98 b) 33 c) 56 d) 78

33. Which of the following can survive without water?

a) humans b) sunflowers c) camels d) limestone

34. If a three pound box is lifted vertically for two feet without an inclined plane, how much overall work was done in the total process (in foot pounds)?

a) 5 b) 6 c) 1 d) 0

35. Which requires the least amount of *overall* effort to raise a thirty pound box ten feet?

a) a rough inclined plane b) a smooth inclined plane
c) vertically lifting with no inclined plane d) no difference

36. While using a movable pulley, what will happen to the *overall* effort needed to lift an object?

a) increase b) decrease c) no difference d) increases, but not measurably

37. How many pounds could you lift with a movable pulley system with a mechanical advantage of four, if you could lift 200 pounds without the help of the pulleys?

a) 50 b) 200 c) 800 d) 2,000

38. Which of the following pulleys would make lifting a heavy object the easiest?

a) fixed pulley b) movable pulley with mechanical advantage of two
c) movable pulley with mechanical advantage of four d) no difference

39. If you wanted to change the direction of effort, which lever would you use?

a) I b) II c) III d) no lever changes effort direction

40. If the resistance is moved toward the point of effort on a lever, and the amount of effort increases, which type of lever are you using?

a) I b) II c) III d) any type

41. If in a windlass system, the large wheel radius was exactly equal to the radius of the axle, what would the mechanical advantage be equal to?

a) zero b) one c) two d) three

42. When effort is applied to the shaft of a helicopter to make the blade spin, which of the following is gained?

a) speed or distance b) resistance c) nothing d) mechanical advantage

43. If you want to select a windlass that would give the most speed or distance for a given amount of effort, what mechanical advantage would your windlass have?

a) 4 b) 2 c) 1 d) 1/2

44. When a high pressure mass of cool air moves into an area of lower pressure, a cold front is formed producing . . .

a) sunshine b) rain c) light showers d) winter

45. As you walk or drive up a mountain the air pressure . . .

a) increases b) becomes cooler c) becomes warmer d) decreases

46. Which of the following wires can handle a larger current?

a) 20 gauge b) 14 amp c) 12 gauge d) 10 amp

47. When the main flow of electricity does not go through the intended location we call this?

a) short circuit b) overload c) circuit breaker d) fuse

48. Which type of safety device needs to be replaced after a circuit is overloaded?

a) circuit breaker b) ampere c) fuse d) short circuit

49. When zinc and copper are assembled in a voltaic cell, what direction do the electrons flow?

a) copper to zinc b) zinc to copper c) both ways d) do not flow

50. In a voltaic cell, which of the following types of electricity is produced?

a) direct current b) alternating current c) alternating and direct current d) no current is produced

51. If the velocity of a train at one instant is 25 ft/sec., and 1 second later its velocity is 40 ft/sec., then what is the uniform acceleration of the train (units will be in ft/sec. per sec.)?

a) zero b) 5 c) 10 d) 15

52. What would your average speed need to be in order to travel 200 miles in 4 hours?

a) 25 mph b) 50 mph c) 100 mph d) 200 mph

53. Which of the following concepts of motion does NOT take direction into consideration?

a) speed b) momentum c) acceleration d) velocity

54. The idea that many forces acting on an object can be treated separately without effecting each other is an example of which of the following?

a) periodic motion b) circular motion c) relative motion
d) cannot separate forces

55. When a marble, which was rolled around a sharp curve to the right, leaves the curve, in what direction will it tend to travel?

a) right b) left c) cannot tell d) straight

56. Which of the following is not an example of energy conservation?

a) caulking b) R-valve c) weatherstripping d) insulation

57. Which of the following does not help you keep warm in the winter?

a) alcohol b) long underwear c) physical exercise d) electric blanket

58. If a person decides to insulate his home and wants to buy the best insulation he can, which of the following would he purchase?

a) R-14 b) BTU-4 c) R-36 d) BTU-20

59. Which of the following should you not use on a grease fire?

a) baking soda b) flour c) water d) dirt

60. Certain chemicals can be very dangerous when mixed together; which of the following can cause this type of reaction?

a) zinc and sulfide b) ammonia and chlorine c) phosphorous and zinc
d) potassium and sulfide

61. If you place a cup of alcohol in the sun and an equal cup of alcohol in a refrigerator, which will evaporate quicker if everything else is held constant?

a) cup in sun b) cup in refrigerator c) both cups same
d) cannot determine

62. In the experiment described in "something to try," which thermometer would read lower several seconds after removing the two thermometers from the two liquids?

a) water b) alcohol c) same d) cannot determine